



STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

**NOTICE TO BIDDERS
AND
SPECIAL PROVISIONS**

**FOR CONSTRUCTION ON STATE HIGHWAY IN SAN DIEGO COUNTY IN
CHULA VISTA FROM 0.4 MILE SOUTH OF EAST PALOMAR STREET
OVERCROSSING TO 0.1 MILE NORTH OF NAPLES STREET
UNDERCROSSING**

In District 11 On Route 805

Under

Bid book dated October 15, 2012

Standard Specifications dated 2010

Project plans approved June 25, 2012

Standard Plans dated 2010

Identified by

Contract No. 11-2T1824

11-SD-805-4.7/5.6

Project ID 1100020051

Electronic Advertising Contract

Bids open Thursday, December 6, 2012

Dated October 15, 2012

AADD

OSD

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SPECIAL NOTICES

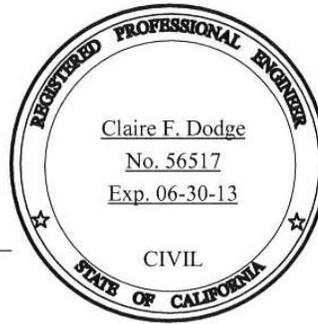
- See section 2-1.04 for the purpose, location and time of the outreach meeting.

CONTRACT NO. 11-2T1824

The special provisions contained herein have been prepared by or under the direction of the following Registered Persons.

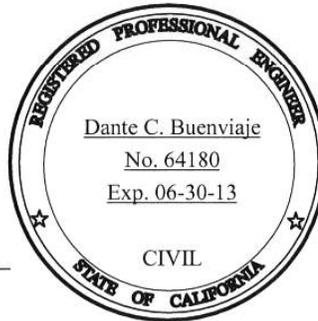
HIGHWAY

Claire F. Dodge
REGISTERED CIVIL ENGINEER



ELECTRICAL

Dante C. Buenviaje
REGISTERED CIVIL ENGINEER



LANDSCAPE

Tom Browne
LICENSED LANDSCAPE ARCHITECT



CONTRACT NO. 11-2T1824

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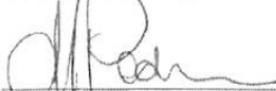
STRUCTURES



REGISTERED CIVIL ENGINEER



UTILITIES



REGISTERED CIVIL ENGINEER



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CANCELED STANDARD PLANS LIST

The standard plan sheets listed below are canceled and not applicable to this contract.

B3-1	Canceled on April 20, 2012
B3-2	Canceled on April 20, 2012
B3-3	Canceled on April 20, 2012
B3-4	Canceled on April 20, 2012
B3-7	Canceled on April 20, 2012
B3-8	Canceled on April 20, 2012
ES-8	Canceled on January 20, 2012
ES-10	Canceled on July 20, 2012

NOTICE TO BIDDERS

Bids open Thursday, December 6, 2012

Dated October 15, 2012

General work description: Replace structure and construct direct access ramp (DAR).

The Department will receive sealed bids for CONSTRUCTION ON STATE HIGHWAY IN SAN DIEGO COUNTY IN CHULA VISTA FROM 0.4 MILE SOUTH OF EAST PALOMAR STREET OVERCROSSING TO 0.1 MILE NORTH OF NAPLES STREET UNDERCROSSING.

District-County-Route-Post Mile: 11-SD-805-4.7/5.6

Contract No. 11-2T1824

The Contractor must have either a Class A license or a combination of Class C licenses which constitutes a majority of the work.

The Department establishes no DVBE Contract goal but encourages bidders to obtain DVBE participation.

Bids must be on a cost+time basis.

Complete the work within the number of working days bid.

Do not bid more than 320 working days.

Do not include plant establishment working days in your bid.

Complete the plant establishment work within 250 working days.

The estimated cost of the project is \$39,000,000.

The Department will receive bids until 2:00 p.m. on the bid open date at 3347 Michelson Drive, Suite 100, Irvine, CA 92612-1692. Bids received after this time will not be accepted.

The Department will open and publicly read the bids at the above location immediately after the specified closing time.

District office addresses are provided in the *Standard Specifications*.

Present bidders' inquiries to the Department and view the Department's responses at:

http://www.dot.ca.gov/hq/esc/oe/project_status/bid_inq.html

Questions about alleged patent ambiguity of the plans, specifications, or estimate must be asked before bid opening. After bid opening, the Department does not consider these questions as bid protests.

Submit your bid with bidder's security equal to at least 10 percent of the bid.

Under Govt Code § 14835 et seq. and 2 CA Code of Regs § 1896 et seq., the Department gives preference to certified small businesses and non-small businesses who commit to 25 percent certified small business participation.

Under Pub Cont Code § 6107, the Department gives preference to a "California company," as defined, for bid comparison purposes over a nonresident contractor from any state that gives or requires a preference to be given to contractors from that state on its public entity construction contracts.

Prevailing wages are required on this Contract. The Director of the California Department of Industrial Relations determines the general prevailing wage rates. Obtain the wage rates at the DIR Web site,

<http://www.dir.ca.gov>, or from the Department's Labor Compliance Office of the district in which the work is located.

The Department has made available Notices of Suspension and Proposed Debarment from the Federal Highway Administration. For a copy of the notices, go to http://www.dot.ca.gov/hq/esc/oe/contractor_info. Additional information is provided in the Excluded Parties List System at <https://www.epls.gov>.

Department of Transportation

D11CFD

COPY OF BID ITEM LIST

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
1	070012	PROGRESS SCHEDULE (CRITICAL PATH METHOD)	LS	LUMP SUM
2	024892	TEMPORARY CHAIN LINK FENCE (TYPE CL-6,SLATTED)	LF	4,160
3	071325	TEMPORARY FENCE (TYPE ESA)	LF	380
4	074019	PREPARE STORM WATER POLLUTION PREVENTION PLAN	LS	LUMP SUM
5	074028	TEMPORARY FIBER ROLL	LF	37,500
6	074032	TEMPORARY CONCRETE WASHOUT FACILITY	EA	23
7	074033	TEMPORARY CONSTRUCTION ENTRANCE	EA	11
8	074035	TEMPORARY CHECK DAM	LF	310
9	074037	MOVE-IN/MOVE-OUT (TEMPORARY EROSION CONTROL)	EA	12
10	074038	TEMPORARY DRAINAGE INLET PROTECTION	EA	84
11	074040	TEMPORARY HYDRAULIC MULCH (BONDED FIBER MATRIX)	SQYD	56,700
12	074041	STREET SWEEPING	LS	LUMP SUM
13	074042	TEMPORARY CONCRETE WASHOUT (PORTABLE)	LS	LUMP SUM
14	074056	RAIN EVENT ACTION PLAN	EA	22
15	074057	STORM WATER ANNUAL REPORT	EA	3
16	074058	STORM WATER SAMPLING AND ANALYSIS DAY	EA	15
17	090105	TIME-RELATED OVERHEAD (LS)	LS	LUMP SUM
18	120090	CONSTRUCTION AREA SIGNS	LS	LUMP SUM
19	120100	TRAFFIC CONTROL SYSTEM	LS	LUMP SUM
20	120120	TYPE III BARRICADE	EA	60

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
21	120199	TRAFFIC PLASTIC DRUM	EA	270
22	128651	PORTABLE CHANGEABLE MESSAGE SIGN (EA)	EA	6
23	129000	TEMPORARY RAILING (TYPE K)	LF	19,900
24	129100	TEMPORARY CRASH CUSHION MODULE	EA	42
25	024893	TEMPORARY CRASH CUSHION (ALTERNATIVE INLINE BARRIER)	EA	4
26	130100	JOB SITE MANAGEMENT	LS	LUMP SUM
27	141101	REMOVE YELLOW PAINTED TRAFFIC STRIPE (HAZARDOUS WASTE)	LF	11,300
28	148005	NOISE MONITORING	LS	LUMP SUM
29	150605	REMOVE FENCE	LF	4,860
30	150662	REMOVE METAL BEAM GUARD RAILING	LF	2,500
31	150685	REMOVE IRRIGATION FACILITY	LS	LUMP SUM
32	150711	REMOVE PAINTED TRAFFIC STRIPE	LF	87,700
33	150715	REMOVE THERMOPLASTIC PAVEMENT MARKING	SQFT	340
34	150742	REMOVE ROADSIDE SIGN	EA	23
35	150757	REMOVE SIGN STRUCTURE (EA)	EA	1
36	024894	REMOVE WATER METER	EA	8
37	024895	REMOVE BLOWOFF ASSEMBLY	EA	2
38	024896	REMOVE COMBINATION AIR RELEASE AND AIR/VACUUM VALVE	EA	1
39	150809	REMOVE CULVERT (LF)	LF	720
40	150820	REMOVE INLET	EA	12

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
41	150821	REMOVE HEADWALL	EA	2
42	024897	RECONSTRUCT SEWER MANHOLE	EA	1
43	152390	RELOCATE ROADSIDE SIGN	EA	2
44	152451	ADJUST WATER VALVE	EA	17
45	152475	ADJUST SEWER MANHOLE	EA	4
46	153103	COLD PLANE ASPHALT CONCRETE PAVEMENT	SQYD	2,790
47	153121	REMOVE CONCRETE (CY)	CY	340
48	153230	REMOVE CONCRETE BARRIER (TYPE 50)	LF	3,990
49	153251	REMOVE SOUND WALL (LF)	LF	420
50	157550	BRIDGE REMOVAL	LS	LUMP SUM
51	160102	CLEARING AND GRUBBING (LS)	LS	LUMP SUM
52	190101	ROADWAY EXCAVATION	CY	126,000
53	190110	LEAD COMPLIANCE PLAN	LS	LUMP SUM
54 (F)	192003	STRUCTURE EXCAVATION (BRIDGE)	CY	5,080
55 (F)	192037	STRUCTURE EXCAVATION (RETAINING WALL)	CY	31,572
56 (F)	193003	STRUCTURE BACKFILL (BRIDGE)	CY	4,175
57 (F)	193013	STRUCTURE BACKFILL (RETAINING WALL)	CY	34,288
58 (F)	193031	PERVIOUS BACKFILL MATERIAL (RETAINING WALL)	CY	573
59	200002	ROADSIDE CLEARING	LS	LUMP SUM
60	024898	POTTING SOIL	CY	8

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
61	200102	IMPORTED TOPSOIL (CY)	CY	3,480
62	200114	ROCK BLANKET	SQYD	8,830
63	200117	DECOMPOSED GRANITE (MISCELLANEOUS AREAS)(SQFT)	SQFT	28,600
64	200120	CULTIVATE	SQYD	580
65	200122	WEED GERMINATION	SQYD	12,200
66	024899	ROCK MULCH (TYPE 1)	SQYD	1,370
67	024900	ROCK MULCH (TYPE 2)	SQYD	5,470
68	024901	ROCK MULCH (TYPE 3)	SQYD	1,690
69	202004	IRON SULFATE (LB)	LB	1,100
70	202006	SOIL AMENDMENT	CY	130
71	202011	MULCH	CY	200
72	202035	FERTILIZER (PACKET)	EA	16,525
73	202036	SLOW RELEASE OR CONTROLLED RELEASE FERTILIZER	LB	320
74	203021	FIBER ROLLS	LF	31,700
75	204006	PLANT (GROUP F)	EA	36,100
76	204011	PLANT (GROUP K)	EA	350
77	204035	PLANT (GROUP A)	EA	1,350
78	204036	PLANT (GROUP B)	EA	3,860
79	204038	PLANT (GROUP U)	EA	89
80	024977	TURF (SOD)	SQFT	340

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
81	024902	NATIVE SOD	SQFT	4,830
82	204099	PLANT ESTABLISHMENT WORK	LS	LUMP SUM
83	205062	ROOT BARRIER	LF	7,260
84	024903	PRECAST CONCRETE PLANTER	EA	11
85	024904	STEEL BENCH	EA	8
86	024905	TREE GRATE AND FRAME	EA	11
87	206400	CHECK AND TEST EXISTING IRRIGATION FACILITIES	LS	LUMP SUM
88	206560	CONTROL AND NEUTRAL CONDUCTORS	LS	LUMP SUM
89	206602	1" ELECTRIC REMOTE CONTROL VALVE	EA	84
90	206604	1 1/2" ELECTRIC REMOTE CONTROL VALVE	EA	37
91	024906	1" MASTER ELECTRIC REMOTE CONTROL VALVE	EA	1
92	024907	1 1/2" MASTER ELECTRIC REMOTE CONTROL VALVE	EA	1
93	024908	2" MASTER ELECTRIC REMOTE CONTROL VALVE	EA	3
94	024909	1" FLOW SENSOR	EA	1
95	024910	1 1/2" FLOW SENSOR	EA	1
96	024911	2" FLOW SENSOR	EA	3
97	024912	16 STATION IRRIGATION CONTROLLER AND ENCLOSURE	EA	1
98	024913	24 STATION IRRIGATION CONTROLLER AND ENCLOSURE	EA	1
99	024914	32 STATION IRRIGATION CONTROLLER AND ENCLOSURE	EA	2
100	024915	40 STATION IRRIGATION CONTROLLER AND ENCLOSURE	EA	1

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
101	024916	48 STATION IRRIGATION CONTROLLER AND ENCLOSURE	EA	1
102 (F)	024917	1" COPPER PIPE (SUPPLY LINE) (TYPE K)	LF	20
103 (F)	024918	2" COPPER PIPE (SUPPLY LINE) (TYPE K)	LF	80
104	024919	2" WATER METER	EA	5
105	208310	IRRIGATION SLEEVE	LF	490
106	024920	1" RECYCLED WATER CONNECTION ASSEMBLY AND ENCLOSURE	EA	1
107	024921	1 1/2" RECYCLED WATER CONNECTION ASSEMBLY AND ENCLOSURE	EA	1
108	024922	2" RECYCLED WATER CONNECTION ASSEMBLY AND ENCLOSURE	EA	3
109	208459	SPRINKLER (TYPE A-11)	EA	92
110	208460	SPRINKLER (TYPE A-12)	EA	79
111	208465	SPRINKLER (TYPE A-5)	EA	26
112	208471	SPRINKLER (TYPE B-1)	EA	13
113	208472	SPRINKLER (TYPE B-2)	EA	650
114	208474	SPRINKLER (TYPE B-4)	EA	8
115	208477	SPRINKLER (TYPE B-7)	EA	50
116	208478	SPRINKLER (TYPE B-8)	EA	250
117	208479	SPRINKLER (TYPE B-9)	EA	490
118	208480	SPRINKLER (TYPE C-2 MOD)	EA	690
119	024923	SPRINKLER (TYPE C-1 MOD)	EA	33
120	208574	1 1/2" GATE VALVE	EA	8

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
121	208575	2" GATE VALVE	EA	23
122	208588	3" GATE VALVE	EA	6
123 (F)	208595	1" PLASTIC PIPE (SCHEDULE 40) (SUPPLY LINE)	LF	30,674
124 (F)	208596	1 1/4" PLASTIC PIPE (SCHEDULE 40) (SUPPLY LINE)	LF	7,155
125 (F)	208597	1 1/2" PLASTIC PIPE (SCHEDULE 40) (SUPPLY LINE)	LF	2,860
126 (F)	208598	2" PLASTIC PIPE (SCHEDULE 40) (SUPPLY LINE)	LF	7,238
127 (F)	208600	3" PLASTIC PIPE (SCHEDULE 40) (SUPPLY LINE)	LF	4,780
128	024924	1" BALL VALVE	EA	35
129	024925	1 1/2" BALL VALVE	EA	14
130 (F)	208739	10" CORRUGATED HIGH DENSITY POLYETHYLENE PIPE CONDUIT	LF	2,320
131	209202	RECYCLED WATER WARNING SIGNS	LS	LUMP SUM
132	210300	HYDROMULCH	SQFT	363,000
133	210430	HYDROSEED	SQFT	363,000
134	210600	COMPOST	SQFT	288,000
135	210630	INCORPORATE MATERIALS	SQFT	288,000
136	024926	DRAINAGE INLET PROTECTION	EA	5
137	260203	CLASS 2 AGGREGATE BASE (CY)	CY	15,200
138	024927	CLASS 4 AGGREGATE BASE	CY	15,600
139	374002	ASPHALTIC EMULSION (FOG SEAL COAT)	TON	16
140	390131	HOT MIX ASPHALT	TON	11,700

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
141	390136	MINOR HOT MIX ASPHALT	TON	160
142	394074	PLACE HOT MIX ASPHALT DIKE (TYPE C)	LF	100
143	394075	PLACE HOT MIX ASPHALT DIKE (TYPE D)	LF	99
144	394076	PLACE HOT MIX ASPHALT DIKE (TYPE E)	LF	2,140
145	394077	PLACE HOT MIX ASPHALT DIKE (TYPE F)	LF	36
146	394090	PLACE HOT MIX ASPHALT (MISCELLANEOUS AREA)	SQYD	540
147	397005	TACK COAT	TON	18
148	401050	JOINTED PLAIN CONCRETE PAVEMENT	CY	13,500
149	024928	PERVIOUS CONCRETE	CY	3,310
150	024929	PERMEABLE INTERLOCKING CONCRETE PAVEMENT	SQFT	3,190
151	404092	SEAL PAVEMENT JOINT	LF	57,700
152	404093	SEAL ISOLATION JOINT	LF	12,800
153	420201	GRIND EXISTING CONCRETE PAVEMENT	SQYD	15,400
154	490601	16" CAST-IN-DRILLED-HOLE CONCRETE PILING	LF	2,238
155	500001	PRESTRESSING CAST-IN-PLACE CONCRETE	LS	LUMP SUM
156 (F)	510051	STRUCTURAL CONCRETE, BRIDGE FOOTING	CY	1,135
157 (F)	510053	STRUCTURAL CONCRETE, BRIDGE	CY	4,820
158 (F)	510060	STRUCTURAL CONCRETE, RETAINING WALL	CY	14,080
159 (F)	510061	STRUCTURAL CONCRETE, SOUND WALL	CY	1,035
160 (F)	044085	STRUCTURAL CONCRETE, PRIVACY WALL	CY	160

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
161 (F)	044086	STRUCTURAL CONCRETE, MASONRY BLOCK WALL (TYPE 1)	CY	19
162 (F)	510086	STRUCTURAL CONCRETE, APPROACH SLAB (TYPE N)	CY	360
163 (F)	044087	STRUCTURAL CONCRETE, JUNCTION STRUCTURE	CY	73
164 (F)	510092	STRUCTURAL CONCRETE, HEADWALL	CY	1.9
165 (F)	510502	MINOR CONCRETE (MINOR STRUCTURE)	CY	315
166 (F)	044088	ARCHITECTURAL TREATMENT (ASHLAR TILE TEXTURE) (SMALL)	SQFT	12,754
167 (F)	044089	ARCHITECTURAL TREATMENT (ASHLAR TILE TEXTURE)	SQFT	71,930
168 (F)	044090	ARCHITECTURAL TREATMENT (LOUVER TEXTURE)	SQFT	61,854
169 (F)	024970	ARCHITECTURAL TREATMENT (DRY STACK TEXTURE)	SQFT	3,180
170 (F)	511047	ANTI-GRAFFITI COATING	SQFT	4,665
171 (F)	518201	MASONRY BLOCK WALL	SQFT	16,720
172 (F)	024971	MASONRY BLOCK WALL (PRIVACY WALL)	SQFT	11,739
173 (F)	024972	MASONRY BLOCK WALL (TYPE 1)	SQFT	850
174	519095	JOINT SEAL ASSEMBLY (MR 4")	LF	75
175	519100	JOINT SEAL (MR 2")	LF	321
176 (F)	520102	BAR REINFORCING STEEL (BRIDGE)	LB	1,300,000
177 (F)	520103	BAR REINFORCING STEEL (RETAINING WALL)	LB	1,577,886
178 (F)	560213	FURNISH SIGN STRUCTURE (LIGHTWEIGHT)	LB	20,597
179 (F)	560214	INSTALL SIGN STRUCTURE (LIGHTWEIGHT)	LB	20,597
180 (F)	560218	FURNISH SIGN STRUCTURE (TRUSS)	LB	90,627

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
181 (F)	560219	INSTALL SIGN STRUCTURE (TRUSS)	LB	90,627
182	560244	FURNISH LAMINATED PANEL SIGN (1"-TYPE A)	SQFT	800
183	560248	FURNISH SINGLE SHEET ALUMINUM SIGN (0.063"-UNFRAMED)	SQFT	670
184	560249	FURNISH SINGLE SHEET ALUMINUM SIGN (0.080"-UNFRAMED)	SQFT	8
185	560251	FURNISH SINGLE SHEET ALUMINUM SIGN (0.063"-FRAMED)	SQFT	130
186	561005	36" CAST-IN-DRILLED-HOLE CONCRETE PILE (SIGN FOUNDATION)	LF	54
187	561016	60" CAST-IN-DRILLED-HOLE CONCRETE PILE (SIGN FOUNDATION)	LF	73
188	562001	METAL (ROADSIDE SIGN)	LB	60
189	562002	METAL (BARRIER MOUNTED SIGN)	LB	780
190	566011	ROADSIDE SIGN - ONE POST	EA	67
191	566012	ROADSIDE SIGN - TWO POST	EA	3
192	568001	INSTALL SIGN (STRAP AND SADDLE BRACKET METHOD)	EA	7
193	568015	INSTALL SIGN (MAST-ARM HANGER METHOD)	EA	15
194	597601	PREPARE AND STAIN CONCRETE	SQFT	3,180
195	620140	24" ALTERNATIVE PIPE CULVERT	LF	4,020
196 (F)	620800	CONCRETE BACKFILL (PIPE TRENCH)	CY	1.2
197	642110	12" SLOTTED PLASTIC PIPE	LF	340
198	650014	18" REINFORCED CONCRETE PIPE	LF	360
199	650018	24" REINFORCED CONCRETE PIPE	LF	1,830
200	650022	30" REINFORCED CONCRETE PIPE	LF	62

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
201	650026	36" REINFORCED CONCRETE PIPE	LF	80
202	650034	48" REINFORCED CONCRETE PIPE	LF	92
203	650420	30" REINFORCED CONCRETE PIPE (CLASS IV)	LF	9
204	680283	3" PLASTIC PIPE UNDERDRAIN	LF	280
205	024930	4" PERFORATED PLASTIC PIPE UNDERDRAIN	LF	590
206	680902	6" PERFORATED PLASTIC PIPE UNDERDRAIN	LF	470
207	024931	6" PLASTIC PIPE	LF	130
208	700617	DRAINAGE INLET MARKER	EA	16
209	703450	WELDED STEEL PIPE CASING (BRIDGE)	LF	80
210	705206	24" CONCRETE FLARED END SECTION	EA	1
211	705214	48" CONCRETE FLARED END SECTION	EA	1
212	707467	36" REINFORCED CONCRETE PIPE RISER	LF	97
213 (F)	721013	ROCK SLOPE PROTECTION (1/4 T, METHOD B) (CY)	CY	12
214 (F)	721015	ROCK SLOPE PROTECTION (LIGHT, METHOD B) (CY)	CY	40
215	721400	CONCRETE (SLOPE PROTECTION)	CY	120
216	729011	ROCK SLOPE PROTECTION FABRIC (CLASS 8)	SQYD	130
217	730040	MINOR CONCRETE (GUTTER) (LF)	LF	370
218	730070	DETECTABLE WARNING SURFACE	SQFT	110
219	731502	MINOR CONCRETE (MISCELLANEOUS CONSTRUCTION)	CY	1,180
220	024932	MINOR CONCRETE (TYPE 1) (EXPOSED AGGREGATE)	CY	60

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
221	024933	MINOR CONCRETE (TYPE 2) (SEEDED AGGREGATE)	CY	350
222	024934	MINOR CONCRETE (TYPE 3) (COLORED)	CY	160
223	735000	PARKING BUMPER (PRECAST CONCRETE)	EA	17
224 (F)	750001	MISCELLANEOUS IRON AND STEEL	LB	34,108
225	024935	WEATHERING STEEL PLATE	EA	22
226 (F)	750501	MISCELLANEOUS METAL (BRIDGE)	LB	500
227 (F)	750505	BRIDGE DECK DRAINAGE SYSTEM	LB	23,250
228	024936	OBSERVATION WELL	EA	2
229	024937	2" COPPER WATER LINE	LF	530
230	024938	8" POLYVINYL CHLORIDE WATER LINE (RECYCLED)	LF	2,040
231	024939	CATHODIC PROTECTION TEST STATION	EA	4
232	024940	FIRE HYDRANT	EA	1
233	024941	12" POLYVINYL CHLORIDE WATER LINE	LF	410
234	024942	2" BLOWOFF ASSEMBLY	EA	2
235	024943	12" CEMENT MORTAR LINED AND COATED STEEL WATER LINE	LF	380
236	024978	6" GATE VALVE	EA	1
237	024944	2" COMBINATION AIR RELEASE AND AIR/VACUUM VALVE	EA	4
238	024945	20" WELDED STEEL PIPE CASING	LF	140
239	024946	12" GATE VALVE	EA	1
240	024947	SEISMIC EXPANSION ASSEMBLY	EA	4

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
241	024948	MINOR CONCRETE (MAT)	CY	3.8
242	024949	8" CEMENT MORTAR LINED AND COATED STEEL WATER LINE (RECYCLED)	LF	320
243	024950	FENCE (TYPE 1)	LF	420
244	800320	CHAIN LINK FENCE (TYPE CL-4)	LF	260
245	800360	CHAIN LINK FENCE (TYPE CL-6)	LF	1,990
246	802501	4' CHAIN LINK GATE (TYPE CL-6)	EA	7
247	024951	10' PIPE GATE	EA	4
248	832001	METAL BEAM GUARD RAILING	LF	77
249 (F)	833032	CHAIN LINK RAILING (TYPE 7)	LF	414
250 (F)	833085	PIPE HANDRAILING	LF	56
251 (F)	833090	TUBULAR HANDRAILING (MODIFIED)	LF	321
252 (F)	024952	TUBULAR HANDRAILING (MODIFIED 2)	LF	824
253 (F)	833142	CONCRETE BARRIER (TYPE 26 MODIFIED)	LF	2,427
254 (F)	024953	CONCRETE BARRIER (TYPE 26 MODIFIED 2)	LF	376
255 (F)	839521	CABLE RAILING	LF	9
256	839581	END ANCHOR ASSEMBLY (TYPE SFT)	EA	1
257	839585	ALTERNATIVE FLARED TERMINAL SYSTEM	EA	1
258	839591	CRASH CUSHION, SAND FILLED	EA	14
259	024954	CRASH CUSHION (SCI100GM)	EA	1
260	839604	CRASH CUSHION (REACT 9CBB)	EA	1

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
261	024955	CONCRETE BARRIER (TYPE 60C MODIFIED)	LF	710
262	024956	CONCRETE BARRIER (TYPE 60C MODIFIED 2)	LF	6,180
263	024957	CONCRETE BARRIER (TYPE 60C MODIFIED 3)	LF	820
264	024958	CONCRETE BARRIER (TYPE 60C MODIFIED 4)	LF	1,700
265	839699	CONCRETE BARRIER (TYPE 60P)	LF	36
266	839701	CONCRETE BARRIER (TYPE 60)	LF	2,780
267 (F)	839702	CONCRETE BARRIER (TYPE 60A)	LF	252
268	024959	CONCRETE BARRIER (TYPE 60 MODIFIED)	LF	1,050
269	839709	CONCRETE BARRIER (TYPE 60GE)	LF	260
270	024960	CONCRETE BARRIER (TYPE 60 MODIFIED 2)	LF	130
271	024961	PORTABLE CONCRETE BARRIER (TYPE 60K)	LF	2,660
272	024962	CONCRETE BARRIER (TYPE 60GA MODIFIED)	LF	130
273 (F)	839725	CONCRETE BARRIER (TYPE 736)	LF	532
274 (F)	024963	CONCRETE BARRIER (TYPE 736B MODIFIED)	LF	756
275	840516	THERMOPLASTIC PAVEMENT MARKING (ENHANCED WET NIGHT VISIBILITY)	SQFT	3,820
276	840655	PAINT TRAFFIC STRIPE (1-COAT)	LF	39,800
277	840656	PAINT TRAFFIC STRIPE (2-COAT)	LF	111,000
278	840666	PAINT PAVEMENT MARKING (2-COAT)	SQFT	410
279	846001	4" THERMOPLASTIC TRAFFIC STRIPE (ENHANCED WET NIGHT VISIBILITY)	LF	47,300
280	846004	4" THERMOPLASTIC TRAFFIC STRIPE (ENHANCED WET NIGHT VISIBILITY) (BROKEN 17-7)	LF	2,070

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
281	846005	4" THERMOPLASTIC TRAFFIC STRIPE (ENHANCED WET NIGHT VISIBILITY) (BROKEN 36-12)	LF	30,600
282	846007	6" THERMOPLASTIC TRAFFIC STRIPE (ENHANCED WET NIGHT VISIBILITY)	LF	1,760
283	846008	6" THERMOPLASTIC TRAFFIC STRIPE (ENHANCED WET NIGHT VISIBILITY) (BROKEN 8-4)	LF	940
284	846009	8" THERMOPLASTIC TRAFFIC STRIPE (ENHANCED WET NIGHT VISIBILITY)	LF	5,460
285	846010	8" THERMOPLASTIC TRAFFIC STRIPE (ENHANCED WET NIGHT VISIBILITY) (BROKEN 12-3)	LF	3,250
286	024979	RAISED RUMBLE STRIP	EA	56
287	850101	PAVEMENT MARKER (NON-REFLECTIVE)	EA	7,410
288	850111	PAVEMENT MARKER (RETROREFLECTIVE)	EA	3,400
289	860090	MAINTAINING EXISTING TRAFFIC MANAGEMENT SYSTEM ELEMENTS DURING CONSTRUCTION	LS	LUMP SUM
290	860201	SIGNAL AND LIGHTING	LS	LUMP SUM
291	860300	SIGNAL AND LIGHTING (CITY STREET LOCATION 1)	LS	LUMP SUM
292	860302	SIGNAL AND LIGHTING (CITY STREET LOCATION 2)	LS	LUMP SUM
293	860402	LIGHTING (CITY STREET)	LS	LUMP SUM
294	860407	LIGHTING (PARKING LOT)	LS	LUMP SUM
295	860460	LIGHTING AND SIGN ILLUMINATION	LS	LUMP SUM
296	860797	ELECTRIC SERVICE (IRRIGATION)	LS	LUMP SUM
297	860930	TRAFFIC MONITORING STATION	LS	LUMP SUM
298	860990	CLOSED CIRCUIT TELEVISION SYSTEM	LS	LUMP SUM
299	024964	COMMUNICATION (PARKING LOT)	LS	LUMP SUM
300	999990	MOBILIZATION	LS	LUMP SUM

SPECIAL PROVISIONS

DIVISION I GENERAL PROVISIONS

1 GENERAL

Add to section 1-1.01:

Bid Items and Applicable Sections

Item code	Item description	Applicable section
070012	PROGRESS SCHEDULE (CRITICAL PATH METHOD)	8
024892	TEMPORARY CHAIN LINK FENCE (TYPE CL-6, SLATTED)	80
071325	TEMPORARY FENCE (TYPE ESA)	14
074019	PREPARE STORM WATER POLLUTION PREVENTION PLAN	13
074028	TEMPORARY FIBER ROLL	13
074032	TEMPORARY CONCRETE WASHOUT FACILITY	13
074033	TEMPORARY CONSTRUCTION ENTRANCE	13
074035	TEMPORARY CHECK DAM	13
074037	MOVE-IN/MOVE-OUT (TEMPORARY EROSION CONTROL)	13
074038	TEMPORARY DRAINAGE INLET PROTECTION	13
074040	TEMPORARY HYDRAULIC MULCH (BONDED FIBER MATRIX)	13
074041	STREET SWEEPING	13
074042	TEMPORARY CONCRETE WASHOUT (PORTABLE)	13
074056	RAIN EVENT ACTION PLAN	13
074057	STORM WATER ANNUAL REPORT	13
074058	STORM WATER SAMPLING AND ANALYSIS DAY	13
024893	TEMPORARY CRASH CUSHION (ALTERNATIVE INLINE BARRIER)	12
024894	REMOVE WATER METER	77
024895	REMOVE BLOWOFF ASSEMBLY	77
024896	REMOVE COMBINATION AIR RELEASE AND AIR/VACUUM VALVE	77
024897	RECONSTRUCT SEWER MANHOLE	77
190110	LEAD COMPLIANCE PLAN	7
024898	POTTING SOIL	20
200102	IMPORTED TOPSOIL (CY)	21
024899	ROCK MULCH (TYPE 1)	20
024900	ROCK MULCH (TYPE 2)	20
024901	ROCK MULCH (TYPE 3)	20
203021	FIBER ROLLS	21
024977	TURF (SOD)	20
024902	NATIVE SOD	20
024903	PRECAST CONCRETE PLANTER	20
024904	STEEL BENCH	20
024905	TREE GRATE AND FRAME	20
024906	1" MASTER ELECTRIC REMOTE CONTROL VALVE	20
024907	1-1/2" MASTER ELECTRIC REMOTE CONTROL VALVE	20
024908	2" MASTER ELECTRIC REMOTE CONTROL VALVE	20
024909	1" FLOW SENSOR	20
024910	1-1/2" FLOW SENSOR	20
024911	2" FLOW SENSOR	20
024912	16 STATION IRRIGATION CONTROLLER AND ENCLOSURE	20
024913	24 STATION IRRIGATION CONTROLLER AND ENCLOSURE	20
024914	32 STATION IRRIGATION CONTROLLER AND ENCLOSURE	20
024915	40 STATION IRRIGATION CONTROLLER AND ENCLOSURE	20
024916	48 STATION IRRIGATION CONTROLLER AND ENCLOSURE	20
024917	1" COPPER PIPE (SUPPLY LINE) (TYPE K)	20
024918	2" COPPER PIPE (SUPPLY LINE) (TYPE K)	20
024919	2" WATER METER	20
024920	1" RECYCLED WATER CONNECTION ASSEMBLY AND ENCLOSURE	20

024921	1-1/2" RECYCLED WATER CONNECTION ASSEMBLY AND ENCLOSURE	20
024922	2" RECYCLED WATER CONNECTION ASSEMBLY AND ENCLOSURE	20
024923	SPRINKLER (TYPE C-1 MOD)	20
024924	1" BALL VALVE	20
024925	1-1/2" BALL VALVE	20
024926	DRAINAGE INLET PROTECTION	21
024927	CLASS 4 AGGREGATE BASE	26
024928	PERVIOUS CONCRETE	40
024929	PERMEABLE INTERLOCKING CONCRETE PAVEMENT	40
044085	STRUCTURAL CONCRETE, PRIVACY WALL	51
044086	STRUCTURAL CONCRETE, MASONRY BLOCK WALL (TYPE 1)	51
044087	STRUCTURAL CONCRETE, JUNCTION STRUCTURE	51
044088	ARCHITECTURAL TREATMENT (ASHLAR TILE TEXTURE) (SMALL)	51
044089	ARCHITECTURAL TREATMENT (ASHLAR TILE TEXTURE)	51
044090	ARCHITECTURAL TREATMENT (LOUVER TEXTURE)	51
024970	ARCHITECTURAL TREATMENT (DRY STACK TEXTURE)	51
511047	ANTI-GRAFFITI COATING	59
024971	MASONRY BLOCK WALL (PRIVACY WALL)	58
024972	MASONRY BLOCK WALL (TYPE 1)	58
561005	36" CAST-IN-DRILLED-HOLE CONCRETE PILE (SIGN FOUNDATION)	49
561016	60" CAST-IN-DRILLED-HOLE CONCRETE PILE (SIGN FOUNDATION)	49
024930	4" PERFORATED PLASTIC PIPE UNDERDRAIN	68
024931	6" PLASTIC PIPE	68
024932	MINOR CONCRETE (TYPE 1) (EXPOSED AGGREGATE)	73
024933	MINOR CONCRETE (TYPE 2) (SEEDED AGGREGATE)	73
024934	MINOR CONCRETE (TYPE 3) (COLORED)	73
024935	WEATHERING STEEL PLATE	75
024936	OBSERVATION WELL	76
024937	2" COPPER WATER LINE	77
024938	8" POLYVINYL CHLORIDE WATER LINE (RECYCLED)	77
024939	CATHODIC PROTECTION TEST STATION	77
024940	FIRE HYDRANT	77
024941	12" POLYVINYL CHLORIDE WATER LINE	77
024942	2" BLOWOFF ASSEMBLY	77
024943	12" CEMENT MORTAR LINED AND COATED STEEL WATER LINE	77
024978	6" GATE VALVE	77
024944	2" COMBINATION AIR RELEASE AND AIR/VACUUM VALVE	77
024945	20" WELDED STEEL PIPE CASING	77
024946	12" GATE VALVE	77
024947	SEISMIC EXPANSION ASSEMBLY	77
024948	MINOR CONCRETE (MAT)	77
024949	8" CEMENT MORTAR LINED AND COATED STEEL WATER LINE (RECYCLED)	77
024950	FENCE (TYPE 1)	80
024951	10' PIPE GATE	80
024952	TUBULAR HANDRAILING (MODIFIED 2)	83
024953	CONCRETE BARRIER (TYPE 26 MODIFIED 2)	83
024954	CRASH CUSHION (SC1-100GM)	83
024955	CONCRETE BARRIER (TYPE 60C MODIFIED)	83
024956	CONCRETE BARRIER (TYPE 60C MODIFIED 2)	83
024957	CONCRETE BARRIER (TYPE 60C MODIFIED 3)	83
024958	CONCRETE BARRIER (TYPE 60C MODIFIED 4)	83
024959	CONCRETE BARREIR (TYPE 60 MODIFIED)	83
024960	CONCRETE BARRIER (TYPE 60 MODIFIED 2)	83
024961	PORTABLE CONCRETE BARRIER (TYPE 60K)	83
024962	CONCRETE BARRIER (TYPE 60GA MODIFIED)	83

Supplemental Project Information

Means	Description
Included in <i>Information Handout</i>	<ol style="list-style-type: none"> 1. Water Source Letter, Dated January 31, 2012. 2. Structural Section Recommendations (Revised to PPB 09-01), Dated June 14, 2010. 3. Culvert Recommendations, Dated December 13, 2011. 4. Revised Foundation Report for Palomar St. OC and HOV Access Ramp, Retaining Walls 302ML and 302MR, and Retaining Wall 18L, Dated November 30, 2011. 5. Geotechnical Design Report for Sound Walls and Retaining Walls, Dated December 1, 2010. 6. Seismic Design Recommendations, Dated September 2, 2010. 7. Revised Geotechnical Design Report for Seven Retaining Walls, Four Privacy Walls and One Soundwall, Dated December 8, 2011. 8. Addendum to the 2010 GDR, Dated December 8, 2011 9. Revised Foundation Report for Retaining Wall No.301L, Dated November 10, 2011. 10. 2nd Revised Foundation Report for Retaining Wall No. 301L, Dated February 1, 2012. 11. Aerially Deposited Lead Survey Report, Dated May 27, 2011. 12. Approved Materials List For Potable Water, Recycled Water and Sewer Facilities, Dated November 23, 2011 13. Allowable Leakage Chart For Testing Of PVC, Steel, DI Pipes With Rubber Joints, Dated September 3, 2001. 14. RWQCB 401 Certification Waiver, Dated March 21, 2012 15. U.S. Department Of The Interior, Fish and Wildlife Service, Biological Opinion, Dated April 19, 2011 16. Department Of The Army Nationwide Permit Verification, Dated May 9, 2012. 17. California Department of Fish and Game Agreement, Dated April 12, 2012.
Available as specified in the <i>Standard Specifications</i>	Cross sections Bridge as-built drawings

Replace in section 2-1.44 with:

2-1.44 ESCROW OF BID DOCUMENTATION

Escrowed bid documentation must contain all documents, including calculations, used to compile the bid submittal. Clearly itemize your estimated costs of performing the work. Calculations must be complete and detailed enough to allow for an in-depth analysis of your bid. These are the only documents that will be accepted from you regarding preparation of the bid for use in resolution of disputes.

An authorized representative from each of the 1st, 2nd, and 3rd apparent low bidders must submit bid documentation for escrow.

Submit the name of the person authorized to deliver the documentation , to the Duty Senior before the close of business on the first Monday following bid opening.

The authorized person must submit documentation to the Duty Senior for escrow on the first Tuesday after bid opening between the hours of 1:00 p.m. and 2:00 p.m.

Submit bid documentation to the Department at the following location:

DISTRICT 11 CONSTRUCTION DUTY SENIOR
4950 Taylor Street

San Diego, CA 92110

TELEPHONE NUMBER (619) 688-6635

FAX NUMBER (619) 688-6988

E-MAIL Duty Senior District11 Duty Senior@dot.ca.gov

If notified, the 4th and subsequent apparent low bidders must present bid documentation for escrow.

Nothing in the escrowed documentation is to be construed to change or modify the terms or conditions of the contract.

The Department will not use escrowed bid documentation for preaward evaluation of your anticipated methods of construction or to assess your qualifications for performing the work.

Failure to submit the actual and complete bid documentation as specified herein within the time specified is cause for rejection of the bid.

Bid documentation for escrow must include:

1. Quantity takeoffs.
2. Rate schedules for the direct costs and the time- and nontime-related indirect costs for:
 - 2.1. Labor (by craft).
 - 2.2. Plant and equipment ownership and operation.
 - 2.3. Permanent and expendable materials, insurance, and subcontracted work.
3. Estimated construction schedules, including sequence and duration, and development of production rates.
4. Quotations, terms, and limitations of quotes and subcontracts related to subcontractors, manufacturers, and suppliers.
5. Estimates of field and home office overhead.
6. Estimated contingency and profit for each bid item of work.
7. Names of the persons responsible for preparing the bidder's estimate and other reports, calculations, assumptions, and supplemental information used by the bidder to arrive at the estimate submitted with the Bid book.
8. Bid documentation for each subcontractor, manufacturer, and supplier whose subcontract or purchase orders exceed or are expected to exceed \$250,000.00. Bid documentation for other subcontractors, manufacturers, and suppliers may be submitted, if required by the bidder, or requested by the subcontractor, manufacturer, or supplier.

If the bidder is a joint venture, the bid documentation must include the joint venture agreement, the joint venture estimate comparison, and final reconciliation of the joint venture bid.

The bid documentation of a subcontractor, manufacturer, or supplier must conform to the same requirements as the bidder's documentation.

The Department provides copies of the verified Bid books submitted by the 1st, 2nd, and 3rd low bidders to the respective bidders for inclusion in the bid documentation to be escrowed.

Bid documentation must be submitted as a paper copy in a sealed container, clearly marked with the bidder's name, date of submittal, contract number, and the words, "Bid Documentation for Escrow."

Signing the bid form certifies that you have examined the contents and have submitted all documents used in preparation of the bid submittal for escrow.

Subcontracts and purchase orders not executed or entered into at the time of bid must be submitted for inclusion in the escrowed documentation within 14 days of execution of the subcontract or purchase order.

To substitute a subcontractor, manufacturer, or supplier you must submit replacement bid documentation for review, approval, and escrow before authorization of the substitution will be granted.

The authorized representatives of the low bidder and the Department will evaluate the apparent low bidder's documents for escrow for legibility and to ensure authenticity.

Upon request, the bid documentation of a subcontractor, manufacturer, or supplier will be evaluated only by the subcontractor, manufacturer, or supplier and the Department and must be placed in a separate container within the bidder's container. The request from the subcontractor, manufacturer, or supplier must be included with the bid documentation.

Evaluation of subcontractors', manufacturers', and suppliers' bid documentation will be accomplished in the same manner as for the bidder's bid documentation.

Evaluation of bid documentation will not include review or constitute approval of:

1. Proposed construction methods
2. Estimating assumptions
3. Interpretation of the contract.

Acceptance or rejection of the bid documentation by the Department will be completed within 48 hours from the time the bid documentation is submitted by the low bidder.

Once the documentation has been evaluated and deemed to be legible and authentic it will be inventoried and escrowed.

The evaluation will not alter any conditions or terms of the contract.

At the completion of the evaluation, the bid documentation will be sealed and jointly deposited at an agreed commercial business in San Diego, CA.

Bid documentation submitted by the second and third apparent low bidders will be jointly deposited at an agreed commercial business in San Diego, CA.

If the apparent low bid is withdrawn or rejected, the bid documentation of the next low bidder will be evaluated and inventoried in the manner specified above, then sealed and deposited again in escrow.

Upon execution of the contract or rejection of all bids, the bid documentation will be returned to the unsuccessful bidders.

Components of the escrowed bid documentation may be examined by your designated representatives and the Department, at any time deemed necessary by either you or the Department or to assist in the negotiation of price adjustments and change orders, or to assist in the potential resolution or in the settlement of claims or disputes.

The joint examination must be performed within 15 days of receipt of a written request to do so by either party. Refusal by you to participate in the joint examination of escrowed bid documentation will be considered as a failure by you to exhaust administrative claim remedies with respect to the particular protest, notice of potential claim, or claim. In addition, this refusal by you constitutes a bar to future arbitration with respect to the protest, potential claim, or claim as provided by Pub Cont Code § 10240.2.

If requested by a Dispute Resolution Advisor or Dispute Resolution Board, the escrowed bid documentation may be used to assist the Advisor or Board in its recommendations.

The bid documentation submitted by the bidder is, and shall remain, the property of the bidder, and is subject to only joint review by the Department and the bidder.

If a subcontractor, manufacturer, or supplier requests, its bid documentation shall be subject to only joint examination by the subcontractor, supplier, or manufacturer and the Department unless it involves a dispute or claim against the Department.

The Department stipulates and expressly acknowledges that the submitted bid documentation constitutes trade secrets and will not be deemed public records. This acknowledgment is based on the Department's express understanding that the information contained in the bid documentation is not known outside the bidder's business, is known only to a limited extent and only by a limited number of employees of the bidder, is safeguarded while in the bidder's possession, is extremely valuable to the bidder and could be extremely valuable to the bidder's competitors by virtue of it reflecting the bidder's contemplated techniques of construction.

The Department acknowledges that the bid documentation includes a compilation of information used in the bidder's business, intended to give the bidder an opportunity to obtain an advantage over competitors who do not know of or use the contents of the documentation.

The Department agrees to safeguard the bid documentation, and all information contained therein, against disclosure, including disclosure of subcontractor bid documentation to you and other subcontractors, to the fullest extent permitted by law.

In the event of arbitration or litigation, the bid documentation shall be subject to discovery, and the Department assumes no responsibility for safeguarding the bid documentation unless you have obtained an appropriate protective order issued by the arbitrator or the court.

Bid documentation will be held in escrow until the Contract has been completed, the ultimate resolution of all disputes and claims has been achieved, and receipt of final payment has been accepted by you. The escrowed bid documentation will then be released from escrow.

The Department pays for the direct cost of depositing the bid documentation in escrow at the agreed commercial business.

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5 CONTROL OF WORK

Add to section 5-1.09A:

The Department encourages the project team to exhaust the use of partnering in dispute resolution before engagement of an objective third party.

For certain disputes, a facilitated partnering session or facilitated dispute resolution session may be appropriate and effective in clarifying issues and resolving all or part of a dispute.

To afford the project team enough time to plan and hold the session, a maximum of 20 days may be added to the DRB referral time following the Engineer's response to a *Supplemental Potential Claim Record*.

To allow this additional referral time, the project team must document its agreement and intention in the dispute resolution plan of the partnering charter. The team may further document agreement of any associated criteria to be met for use of the additional referral time.

If the session is not held, the DRB referral time remains in effect as specified in section 5-1.43.

Add to section 5-1.20A:

During the progress of the work under this Contract, work under the following contracts may be in progress at or near the job site of this Contract:

Coincident or Adjacent Contracts

Contract no.	County–Route–Post Mile	City	Type of work
11-2T1804	SD-805-9.4/13.8	San Diego/National City	To construct north and south bound HOV Lanes
11-2T1814	SD-54,805-1.8,5.5/9.4	Chula Vista/National City	To construct north and south bound HOV Lanes
11-2T1834	SD-805-5.4/13.8	San Diego	To construct soundwalls

Consecutive on-ramp or off-ramps in the same direction of travel may not be closed simultaneously without authorization.

Replace section 5-1.20D with:

5-1.20D Occupied Improvements within the Right-of-Way

Occupied improvements are within the right-of-way at:

1. Parcel No. 34649 (Jones) - Address: 1299 Raven Ave, Chula Vista, CA 91911
2. Parcel No. 34728 (Cooper) - Address: 1298 Raven Ave, Chula Vista, CA 91911

These improvements are vacated and will be removed by October 31, 2012.

Do not take any action that will result in unnecessary inconvenience or disproportionate injury to or that is coercive in nature to the occupants of the improvements.

Add to section 5-1.36D:

Installation of the utilities shown in the following table requires coordination with your activities. Make the necessary arrangements with the utility company through the Engineer and submit a schedule:

1. Verified by a representative of the utility company
2. Allowing at least the time shown for the utility owner to complete its work

Utility Relocation and Contractor-Arranged Time for the Relocation

Utility	Utility address	Location	N/W Days
SDG&E Electrical Power Poles & Configurations	6875 Consolidated Way San Diego, CA 92121-2602	"OL" Line Sta 90+90	21/30
SDG&E Gas 8" HP Gas line	6875 Consolidated Way San Diego, CA 92121-2602	"A1" Line Sta 297+00 to 300+00 [SB shoulder and slope]	28/30
SDG&E Electrical Underground Cables	6875 Consolidated Way San Diego, CA 92121-2602	"RV" Line Sta 60+00 to 61+50 "PL" Line Sta 22+00 to 24+50	21/15
Sprint Cell Box	Phone: 503-519-5891 Alt Phone: 970-882-3575	SDG&E Parcel	21/20
AT&T Underground Cables	7337 Trade Street, #5686 San Diego, CA 92121	"RV" Line Sta 60+00 to 61+50 "PL" Line Sta 48+00 to 50+00	21/27

Installation of the listed utility facilities will require coordination with the Contractor's operations. The Contractor must make the necessary arrangements with the utility owner through the Engineer, and must submit a schedule of work, verified by an authorized representative of the utility owner; to the Engineer for review and approval. The duration of the work in the schedule must equal or exceed the number of notification days (N days) and working days (W days) for the utility owner to complete their work:

Utilities Requiring Coordination with Contractor's Operation

Type of Utility	Location of Utility	Owner	Owner's Address	Utility N/W Days
Cables (Between cell box and antenna)	SDG&E Parcel (Back of RW 296L)	Sprint	Phone: 503-519-5891 Alt Phone: 970-882-3575	21/22

8" HP Gas Line	"A1" Line 299+90 (NB shoulder & slope)	SDG&E Gas	6875 Consolidated Way San Diego, CA 92121-2602	28/30
8" HP Gas Line	"PL" Line 18+70 to 21+80 [Bridge]	SDG&E Gas	6875 Consolidated Way San Diego, CA 92121-2602	21/15
Electrical	"PL" Line 18+70 to 21+80 (Bridge)	SDG&E Electrical	6875 Consolidated Way San Diego, CA 92121-2602	21/15
Telecommunications	"PL" Line 18+70 to 21+80 (Bridge)	AT&T	7337 Trade Street, #5686 San Diego, CA 92121	21/22
Telecommunications	"PL" Line 14+00 to 17+00 RHS (Fill Slope)	AT&T	7337 Trade Street, #5686 San Diego, CA 92121	21/22
Telecommunications	"PL" Line 14+00 to 17+00 RHS (Fill Slope)	COX	5159 Federal Blvd, San Diego, CA 92105	21/22
Electrical & Gas	"PL" Line 14+00 to 17+00 RHS (Fill Slope)	SDG&E	6875 Consolidated Way San Diego, CA 92121-2602	21/15

- N. Notification days. Minimum number of working days written notice the Engineer provides the owner that the site will be ready for utility work
- W. Working days. Number of working days provided to the utility company to complete the listed Utility work.

Site Preparation

The work described in "Site Preparation by Contractor" must be completed by you before the associated utility work described in "Utility Work" can be performed by the utility owner.

Site Preparation Type	Site Preparation Work
(A)	Stage 1A of construction
(B)	Stage 1B of construction
(C)	Stage 2A of construction

Utility Work by Owners

Site Preparation Type (by Contractor)	Owner and Type of Utility	Location of Utility	Work Description	N/W Days
(A)	AT&T Splice Box & Vault	"PL" Line 15+00 to 19+00	Relocate splice box and install vault for bridge facilities	21/22
(A)	Cox Communications Vault	"NC" Line 48+90	Relocate vault to behind proposed sidewalk	21/22
(A)	SDG&E Electrical above ground facilities	"PL" Line 17+50 to 19+00	Relocate pull boxes and meter pedestals	21/15

4. Notification DRA or DRB nominee and disclosure statement

If the submittals for biological resource information program is authorized, you may enter the job site only to measure controlling field dimensions and locating utilities.

Do not start other job site activities until all the submittals from the above list are authorized or accepted and the following information is received by the Engineer:

1. *Notice of Materials To Be Used.*
2. Contingency plan for reopening closures to public traffic.
3. Written statement from the vendor that the order for the sign panels has been received and accepted by the vendor. The statement must show the dates that the materials will be shipped.
4. Written statement from the vendor that the order for electrical material has been received and accepted by the vendor. The statement must show the dates that the materials will be shipped.

You may start job site activities before the 55th day after Contract approval if you:

1. Obtain specified authorization or acceptance for each submittal before the 55th day
2. Receive authorization to start

Submit a notice 72 hours before starting job site activities. If the project has more than 1 location of work, submit a separate notice for each location.

If the Contract is approved, work already performed that complies with the Contract is authorized.

If the Contract is not approved, leave the job site in a neat condition. If a facility has been changed, restore it to its former condition or an equivalent condition. The Department does not pay for the restoration.

The Department grants a time extension if a delay is beyond your control and prevents you from starting work at the job site on the 1st working day.

Add to section 8-1.10A:

Damages additional to those specified in section 8-1.10 are \$5,000.00 per day starting on the 1st day after expiration of the number of working days bid until work requiring lane or shoulder closures on Route 805 is complete.

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9 PAYMENT

Add to section 9-1.16C:

The following items are eligible for progress payment even if they are not incorporated into the work:

1. Prestressing steel for cast-in-place concrete members (in sealed packages) and prestressing anchorages and ducts
2. Masonry block
3. Type B joint seals
4. Joint seal assemblies
5. Bar reinforcing steel
6. Bridge deck drainage system
7. Sign structure and sign panels
8. Alternative pipe culvert
9. Slotted underdrain pipe
10. Reinforced concrete pipe
11. Filter fabric
12. Welded steel pipe casing

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11 QUALITY CONTROL AND ASSURANCE

Replace section 11-4 with:

11-4 CAST-IN-PLACE STRUCTURAL CONCRETE MATERIALS

11-4.01 GENERAL

11-4.01A General

Section 11-4 applies to CIP structural concrete members constructed under sections 49 or 51 except for those members constructed of minor concrete.

Quality control and assurance for CIP structural concrete materials includes:

1. Your QC program
2. Acceptance of the concrete by the Engineer using the Department's test results and verified QC test results

11-4.01B Definitions

lot: quantity represented by the specified minimum QC testing frequency.

11-4.02 QUALITY CONTROL

11-4.02A General

Develop, implement, and maintain a QC program that includes inspection, sampling, and testing of structural concrete materials.

For each ASTM test method specified in this section, the materials must comply with the requirements specified for the comparable test in section 90 unless otherwise specified.

11-4.02B Quality Control Manager

Assign a QC manager. The QC manager must have one of the following qualifications:

1. Civil engineer license in the State of California
2. ACI Concrete Laboratory Testing Technician, Level 1 certification
3. NICET Level II concrete certification
4. ICC Reinforced Concrete Special Inspector certification
5. ASQ Certified Quality Manager

During concrete placement, the QC manager must be at the plant or job site within 3 hours of receiving notification from the Engineer.

11-4.02C Testing and Inspection Personnel

QC laboratory testing personnel must have an ACI Concrete Laboratory Testing Technician, Level 1 certification or an ACI Aggregate Testing Technician, Level 2 certification, whichever certification includes the test being performed.

QC field testing personnel and field and plant inspection personnel must have an ACI Concrete Field Testing Technician, Grade I certification.

11-4.02D Testing Laboratories

Each QC testing laboratory must be an authorized laboratory and have a current accreditation from the AASHTO Accreditation Program for the tests performed.

11-4.02E Concrete Plants

Each concrete plant must:

1. Have a current certification for ready mixed concrete production facilities from the National Ready Mixed Concrete Association. Plant Certification Checklist and supporting documentation must be available for review by the Engineer upon request.
2. Be tested and authorized under California Test 109.

11-4.02F Quality Control Meeting

Before submitting the QC plan, hold a meeting to discuss the requirements for structural concrete QC. The meeting attendees must include the Engineer, the QC manager, and at least 1 representative from each concrete plant.

11-4.02G Submittals

11-4.02G(1) Quality Control Plan

The QC plan must detail the methods used in your QC program to ensure the quality of the work and to provide the controls necessary to produce concrete that complies with the Contract. The QC plan must include the following:

1. Names and documentation of certification or accreditation of the concrete plants and testing laboratories to be used
2. Names, qualifications, and documentation of certifications for the QC manager and all QC testing and inspection personnel to be used
3. Organization chart showing QC personnel and their assigned QC responsibilities
4. Example forms, including forms for certificates of compliance, hard copy test result submittals, and inspection reports
5. Methods and frequencies for performing all QC procedures, including inspections and material testing
6. Procedures to control quality characteristics, including standard procedures to address properties outside of the specified operating range or limits and example reports to document nonconformances and corrective actions taken
7. Procedures for verifying:
 - 7.1. Materials are properly stored during concrete batching operations
 - 7.2. Batch plants have the ability to maintain the concrete consistency during periods of extreme heat and low temperature ranges
 - 7.3. Admixture dispensers deliver the correct dosages within the accuracy requirements specified
 - 7.4. Delivery trucks have a valid NRMCA certification card
8. Procedures for verifying that the weighmaster certificate for each load of concrete shows:
 - 8.1. Concrete as batched complies with the authorized concrete mix design weights
 - 8.2. Moisture corrections are being accurately applied to the aggregates
 - 8.3. Cement and supplementary cementitious materials are from authorized sources
 - 8.4. Any hold back mix water
 - 8.5. Weighmaster signature
9. Procedures for visually inspecting the concrete during discharge operations

Submit 3 copies of the QC plan for review.

Submit an amended QC plan or an addendum to the QC plan if there are any changes to:

1. Concrete plants
2. Testing laboratories
3. Plant certification or laboratory accreditation status
4. Tester or inspector qualification status
5. QC personnel
6. Procedures and equipment

Allow the Department 5 days to review an amended QC plan or an addendum to the QC plan.

Submit 4 copies of each authorized QC plan and make 1 copy available at each location where work is performed.

11-4.02G(2) Concrete Mix Design

In addition to the mix design submittal requirements specified in section 90, submit with your mix design the results from the tests specified in section 11-4.02H and the results from the tests shown in the following table:

Characteristic	ASTM Test Method
Specific gravity and absorption of aggregates	C127 and C128
Durability index for fine aggregate	D3744/D 3744M
Soundness	C88 (use sodium sulfate)
Loss after 500 revolutions	C131
Organic impurities	C40/C 40M
Chloride concentration of water for washing aggregates and mixing concrete	D512 or C114 ^a
Sulfate concentration of water for washing aggregates and mixing concrete	D516 or C114 ^a
Impurities in water for washing aggregates and mixing concrete	C191 or C266 C109/C109M

^aTo adapt the test methods in ASTM C 114 to testing water, use a water sample instead of the cement solution specified and adjust the test procedure accordingly.

The test results must be dated within 1 year of submission of the concrete mix design.

Each mix design must be prequalified under section 90-1.01D(5)(b).

11-4.02G(3) Test Results

Submit QC test results within 1 business day of completing each test.

Within 3 business days of completing each QC test, submit the test results electronically at the following Web site:

<http://www.dot.ca.gov/hq/esc/Translab/DIME/>

A unique test sample identification number must be given to each sample in compliance with the instructions provided at the website above.

Include the following with the test results:

1. Contract number
2. Mix design number
3. Test sample identification number
4. Date and time of test
5. Batch plant
6. Batch number
7. Bridge number and description of element
8. Test results
9. Any supporting data and calculations
10. Name, certification number, and signature of the QC tester

11-4.02G(4) Inspection Reports

Document each inspection performed by a QC inspector in an inspection report that includes:

1. Contract number
2. Mix design number
3. Date and time of inspection
4. Plant location
5. Concrete placement location
6. Batch number

7. Reviewed copies of weighmaster certificates
8. Description of the inspection performed
9. Name, certification number, and signature of the QC inspector

Include the inspection reports in the concrete materials QC summary report.

11-4.02G(5) Concrete Materials Quality Control Summary Report

During concrete production, submit a concrete materials QC summary report at least once a month. The report must include:

1. Inspection reports
2. Test results
3. Documentation of the following:
 - 3.1. QC manager has evaluated all test results
 - 3.2. Problems or deficiencies discovered and the corrective actions taken
 - 3.3. Any testing of repair work performed
 - 3.4. List and explanation of deviations from the specifications or regular practices
4. Certificate of compliance signed by the QC manager. The certificate must state that the information contained in the report is accurate and the materials comply with the Contract.

11-4.02H Quality Control Procedures

Perform all sampling, testing, and inspecting required to control the process and to demonstrate compliance with the Contract and the authorized QC plan.

Provide a QC field inspector at the concrete delivery point while placement activities are in progress. Provide a testing laboratory and testing personnel for QC testing.

Provide the Department unrestricted access to the QC activities.

For each mix design, perform sampling and testing in compliance with the following two tables:

Aggregate QC Tests

Quality Characteristic	ASTM Test Method	Minimum Testing Frequency
Aggregate gradation	C136	Once per each day of pour
Sand equivalent	D2419	Once per each day of pour
Percent fines under 75 microns ^a	C117	Once per each day of pour
Moisture content of fine aggregate ^b	C566	1–2 times per each day of pour, depending on conditions

^aPercent fines under 75 microns test replaces the cleanness test in section 90-1.02C with requirements of 1.5 percent maximum for "Operating Range" and 2.0 percent maximum for "Contract Compliance." The 5th paragraph of section 90-1.02C(2) does not apply.

^bMoisture content must be within half a percent of the value shown on the weighmaster certificate.

Concrete QC Tests

Quality Characteristic	ASTM Test Method	Minimum Testing Frequency
Slump ^a	C143/C143M	Once per 100 CY or each day of pour, whichever is more frequent, and whenever the consistency is in question
Uniformity	C143/C143M and C685/C685M, section A1.10	Whenever the uniformity of the concrete is in question or when requested by the Engineer
Air content, (freeze-thaw area)	C231/C231M or C173/C173M ^b	If concrete is air entrained, once per 30 CY or each day of pour, whichever is more frequent
Air content	C231/C231M or C173/C173M ^b	If concrete is air entrained, once per 100 CY or each day of pour, whichever is more frequent
Temperature	C1064/C1064M	Once per 100 CY or each day of pour, whichever is more frequent
Density	C 138	Once per 100 CY or each day of pour, whichever is more frequent
Compressive strength ^{c,d,e}	C172/C172M, C31/C31M, and C39/C39M	Once per 100 CY or each day of pour, whichever is more frequent

^aThe requirements in section 90-1.02G(6) apply, except slump testing must be used. The slump must be from 1 to 4 inches nominal range and 6 inches maximum value for elements that are 12 inches thick or less and from 1 to 3 inches nominal range and 5 inches maximum value for elements that are over 12 inches thick.

^bASTM C173/C173M must be used for lightweight concrete.

^cCylinders must be 6 by 12 inches.

^dMark each cylinder with the Contract number; the date and time of sampling; and the weighmaster certificate number.

^eAt a minimum, test for compressive strength at the maximum time allowed. You may need additional test samples to facilitate your schedule.

For at least 3 years after final acceptance, retain for review the records generated as part of QC including inspection, sampling, and testing.

11-4.03 DEPARTMENT ACCEPTANCE

11-4.03A General

The Department accepts structural concrete based on the following:

1. Verified QC test results
2. Department's test results

11-4.03B Verification Sampling And Testing

11-4.03B(1) General

The Department performs verification testing of the QC tests for the following quality characteristics:

1. Slump
2. Air content
3. Compressive strength

The ratio of verification testing frequency to the minimum QC testing frequency is 1:3.

11-4.03B(2) Verification

The Department performs verification testing by taking a separate sample from the same load of concrete that you take a sample from for the QC test. The Department determines which load of concrete to be used for verification testing.

The Department uses the same test methods for verification testing as those specified for QC testing.

Construction project funding signs must comply with the details shown on the Department's Traffic Operations Web site.

Keep construction project funding signs clean and in good repair at all times.

12-2.02 MATERIALS

Construction project funding signs must be wood post signs complying with section 56-4.

Sign panels for construction project funding signs must be framed, single sheet aluminum panels complying with section 56-2.

The background on construction project funding signs must be Type II retroreflective sheeting on the Authorized Material List for signing and delineation materials.

The legend must be retroreflective, except for nonreflective black letters and numerals. The colors blue and orange must comply with PR Color no. 3 and no. 6, respectively, as specified in the Federal Highway Administration's *Color Tolerance Chart*.

The legend for the type of project on construction project funding signs must read as follows:

Highway Construction

The legend for the type of funding on construction project funding signs must read as follows:

SANDAG TRANSNET FUNDS

The Engineer will provide the year of completion for the legend on construction project funding signs. Furnish and install a sign overlay for the year of completion within 10 working days of notification.

The size of the legend on construction project funding signs must be as described. Do not add any additional information unless authorized.

12-2.03 CONSTRUCTION

Install 4 Type 2 construction project funding signs at the locations designated by the Engineer before starting major work activities visible to highway users.

When authorized, remove and dispose of construction project funding signs upon completion of the project.

12-2.04 PAYMENT

Not Used

Add to section 12-3.12C:

Start displaying the message on the portable changeable message sign 30 minutes before closing the lane.

Place the portable changeable message sign in advance of the 1st warning sign for each:

1. Stationary lane closure
2. Off-ramp closure

3. Shoulder closure

For 5 days, starting on the day of signal activation, place 1 portable changeable message sign in each direction of travel and display the following message: "SIGNAL AHEAD -- PREPARE TO STOP."

Replace section 12-3.13 with:

12-3.13 IMPACT ATTENUATOR VEHICLE

12-3.13A General

12-3.13A(1) Summary

Section 12-3.13 includes specifications for protecting traffic and workers with an impact attenuator vehicle during moving lane closures and when placing and removing components of stationary lane closures, ramp closures, shoulder closures, or a combination.

Do not use an impact attenuator vehicle to place, remove, or place and remove components of a stationary traffic control system on 2-lane, 2-way highway where the useable shoulder width is less than 10 feet unless authorized.

Impact attenuator vehicles must comply with the following test levels under National Cooperative Highway Research Program 350:

1. Test level 3 if the preconstruction posted speed limit is 50 mph or more
2. Test levels 2 or 3 if the preconstruction posted speed limit is 45 mph or less

Comply with the attenuator manufacturer's instructions for:

1. Support truck
2. Trailer-mounted operation
3. Truck-mounted operation

Flashing arrow signs must comply with section 12-3.03. You may use a portable changeable message sign instead of a flashing arrow sign. If a portable changeable message sign is used as a flashing arrow sign, it must comply with section 6F.56 "Arrow Panels" of the *California MUTCD*.

12-3.13A(2) Definitions

impact attenuator vehicle: A support truck that is towing a deployed attenuator mounted to a trailer or a support truck with a deployed attenuator that is mounted to the support truck.

12-3.13A(3) Submittals

Upon request, submit a certificate of compliance for each attenuator used on the project.

12-3.13A(4) Quality Control and Assurance

Do not start impact attenuator vehicle activities until authorized.

Before starting impact attenuator vehicle activities, conduct a preinstallation meeting with the Engineer, subcontractors, and other parties involved with traffic control to discuss the operation of the impact attenuator vehicle during moving lane closures and when placing and removing components of stationary traffic control systems.

Schedule the location, time, and date for the preinstallation meeting with all participants. Furnish the facility for the preinstallation meeting within 5 miles of the job site or at another location if authorized.

12-3.13B Materials

Attenuators must be a brand on the Authorized Material List for highway safety features.

The combined weight of the support truck and the attenuator must be at least 19,800 pounds, except the weight of the support truck must not be less than 16,100 or greater than 26,400 pounds.

For the Trinity MPS-350 truck-mounted attenuator, the support truck must not have a fuel tank mounted underneath within 10'-6" of the rear of the support truck.

Each impact attenuator vehicle must have:

1. Legal brake lights, taillights, sidelights, and turn signals
2. Inverted "V" chevron pattern placed across the entire rear of the attenuator composed of alternating 4-inch wide nonreflective black stripes and 4-inch wide yellow retroreflective stripes sloping at 45 degrees
3. Type II flashing arrow sign
4. Flashing or rotating amber light
5. Operable 2-way communication system for maintaining contact with workers

12-3.13C Construction

Except where prohibited, use an impact attenuator vehicle:

1. To follow behind equipment and workers who are placing and removing components of a stationary lane closure, ramp closure, shoulder closure, or any combination. Operate the flashing arrow sign in the arrow or caution mode during this activity, whichever applies. Follow at a distance that prevents intrusion into the workspace from passing traffic.
2. As a shadow vehicle in a moving lane closure.

After placing components of a stationary traffic control system you may place the impact attenuator vehicle in advance of the work area or at another authorized location to protect traffic and workers.

Secure objects, including equipment, tools, and ballast on impact attenuator vehicles to prevent loosening upon impact by an errant vehicle.

Do not use a damaged attenuator in the work. Replace any attenuator damaged from an impact during work activities at your expense.

12-3.13 Payment

Not Used

Add section 12-3:

12-3.18 TEMPORARY CRASH CUSHION (ALTERNATIVE INLINE BARRIER)

12-3.18A General

12-3.18A(1) Summary

This section includes specifications for installing and maintaining temporary crash cushion (alternative inline barrier).

12-3.18C Submittals

Submit a certificate of compliance for the temporary crash cushion (alternative inline barrier).

12-3.18C Materials

A temporary crash cushion (alternative inline system) must be on the Authorized Materials List for highway safety features.

12-3.18D Construction

Temporary crash cushions (alternative inline barrier) must be installed under the manufacturer's installation instructions and these specifications.

Concrete anchorage devices for attaching temporary crash cushion (alternative inline barrier) to the base slab is limited which have been provided by the manufacturer.

Concrete anchor slab must comply with section 51, except the strength is to be 4,000 psi at 28 days.

After installing the temporary crash cushion (alternative inline barrier), dispose of surplus excavated material in a uniform manner along the adjacent roadway where designated by the Engineer.

1-3.18E Payment

Not used

Add to section 12-4.02A:

If work including installing, maintaining, and removing Type K temporary railing is to be performed within 6 feet of the adjacent traffic lane, close the adjacent traffic lane.

Except as listed above, closure of the adjacent traffic lane is not required for installing, maintaining, and removing traffic control devices.

For grinding and grooving operations, sawcutting concrete slabs, and installing loop detectors with an impact attenuator vehicle as a shadow vehicle, closure of the adjacent traffic lane is not required.

Designated holidays are as shown in the following table:

Designated Holidays	
Holiday	Date observed
New Year's Day	January 1st
Washington's Birthday	3rd Monday in February
Memorial Day	Last Monday in May
Independence Day	July 4th
Labor Day	1st Monday in September
Veterans Day	November 11th
Thanksgiving Day	4th Thursday in November
Christmas Day	December 25th

If a designated holiday falls on a Sunday, the following Monday is a designated holiday. If November 11th falls on a Saturday, the preceding Friday is a designated holiday.

Freeway closure charts are for the erection and removal of falsework, placement and removal of overhead sign structures, and other authorized work.

Personal vehicles of your employees must not be parked on the traveled way or shoulders, including sections closed to traffic.

If work vehicles or equipment are parked within 6 feet of a traffic lane, close the shoulder area as shown.

At each location where falsework is constructed over a street or route listed, provide openings through the bridge falsework. The type, minimum width, height, and number of openings at each location, and the location and maximum spacing of the falsework lighting, if required for each opening, must comply with the requirements shown in the table. The width of vehicular openings is the clear width between temporary railings or other protective work. The spacing shown in the table for falsework pavement lighting is the maximum distance from center to center, in feet, between fixtures.

_Palomar Street Overcrossing (Br. No. 57-1222)

	Number	Width (feet)	Height (feet)
Vehicle openings	2	61	15
Pedestrian openings	N/A	N/A	N/A
	Location	Spacing	
Falsework pavement lighting	R and L C	40 ft 40 ft, offset 20 ft	

NOTE:
 R = Right side of traffic
 L = Left side of traffic
 C = Centered overhead

The exact location of openings will be determined by the Engineer.

Have the necessary materials and equipment on site to erect or remove the girders falsework in any 1 span or over any 1 opening before detouring or stopping traffic.

Replace "Reserved" in section 12-4.02D with:

The full width of the traveled way must be open to traffic when construction activities are not actively in progress.

Equipment and materials must not remain in a lane unless the lane is closed to traffic and is used for Contract activities.

If a lane is closed for construction activities and opening the lane becomes necessary for use by traffic, immediately stop active Contract activities and start clearing the lane.

Your vehicles are subject to the provisions under chapter 13, "Vehicular Crossings," of the Vehicle Code.

Do not make lane closures if the atmospheric visibility is less than 1,000 feet.

Add to section 12-4.03:

For each 10-minute interval or fraction thereof past the time specified to reopen the closure, the Department will deduct the amount per interval shown below from moneys due or that may become due the Contractor under the Contract. Damages are limited to 5 percent of the project cost per occurrence. Damages will not be assessed if the Engineer orders that the closure remain in place beyond the scheduled pickup time.

Type of facility	Route or segment	Period	Damages/interval (\$)
Mainline	Route 805	1st half hour	\$2,700 / 10 minutes
		2nd half hour	\$4,100/ 10 minutes
		2nd hour and beyond	\$5,450 / 10 minutes

Replace "Reserved" in section 12-4.04 with:

Lane Closure Restriction for Designated Holidays										
Thu	Fri	Sat	Sun	Mon	Tues	Wed	Thu	Fri	Sat	Sun
x	H xx	xx	xx							
x	xx	H xx	xx							
	x	xx	H xx	xx						
	x	xx	xx	H xx	xxx					
				x	H xx					
					x	H xx				
						x	H xx	xx	xx	xx

Legend:

	Refer to lane requirement charts
x	The full width of the traveled way must be open for use by traffic after 0500.
xx	The full width of the traveled way must be open for use by traffic.
xxx	The full width of the traveled way must be open for use by traffic until 0500.
H	Designated holiday

REMARKS: This table is to be used concurrently with all charts except chart No. 5 and 6.

Replace "Reserved" in section 12-4.05B with:

Chart no. 1 Freeway/Expressway Lane Requirements																															
County: SD							Route/Direction: 805/NB										PM: 4.17 – 6.29														
							805/SB										6.29 – 4.17														
Closure limits: 0.52 Mi. north of Main St. UC to 0.23 Mi. north of Telegraph Canyon Rd. UC																															
0.23 Mi. north of Telegraph Canyon Rd. UC to 0.25 Mi. south of Orange Ave. OC																															
From hour to hour 24 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24																															
Mondays through Thursdays							S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S			
Fridays							S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S		
Saturdays							S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	
Sundays							S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S

Legend:

S	Shoulder closure allowed (right / left)
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REMARKS:

Chart no. 2																											
Freeway/Expressway Lane Requirements																											
County: SD					Route/Direction: 805/NB										PM: 3.46 – 6.24												
Closure limits: 0.19 Mi. south of Main St. UC to 0.18 Mi. north of Telegraph Canyon Rd. UC																											
From hour to hour		24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
Mondays through Thursdays		2	2	2	2	2																			2	2	2
Fridays		2	2	2	2	3																					
Saturdays																											
Sundays					2	2	2	2	2																2	2	2
Legend:																											
2		Provide at least 2 adjacent through freeway lanes open in direction of travel																									
3		Provide at least 3 adjacent through freeway lanes open in direction of travel																									
		Work allowed within the highway where lane closure is not required																									
REMARKS:																											

Chart no. 3																											
Freeway/Expressway Lane Requirements																											
County: SD					Route/Direction: 805/SB										PM: 7.00 – 4.22												
Closure limits: 0.49 Mi. north of J St. OC to 0.20 Mi. south of Orange Ave. OC																											
From hour to hour		24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
Mondays through Thursdays		2	2	2	2	2																			3	2	2
Fridays		2	2	2	2	2																					
Saturdays					2	2	2	2	2																		
Sundays					2	2	2	2	2	2	2														2	2	2
Legend:																											
2		Provide at least 2 adjacent through freeway lanes open in direction of travel																									
3		Provide at least 3 adjacent through freeway lanes open in direction of travel																									
		Work allowed within the highway where lane closure is not required																									
REMARKS:																											

Replace "Reserved" in section 12-4.05C with:

Chart no. 4 Complete Freeway/Expressway Closure Hours																										
County: SD					Route/Direction: 805/NB										PM: 4.42 – 5.11											
Closure limits: E. Orange Ave. OC to 0.05 Mi. north of Palomar St. OC																										
From hour to hour		24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Mondays through Thursdays		C	C	C	C																					
Fridays		C	C	C	C																					
Saturdays																										
Sundays																										

Legend:

C Freeway or expressway may be closed completely

No complete freeway or expressway closure is allowed

REMARKS:

No other closure that conflicts with or shares any elements of the following detours will be permitted.
 This chart is to be used for a maximum of fifteen (15) nights.
 Seven (7) nights for the demolition of E. Palomar St. OC.
 Eight (8) nights for falsework erection and removal.

Detour NB 805 for the full Freeway closure
 Detour NB 805 traffic via northerly on Rte. 805 to NB 805 Off-ramp to East Orange Ave./Olympic Pkwy., thence easterly on E. Orange Ave. to Brandywine Ave., thence northerly on Brandywine Ave./Medical Center Dr. to Telegraph Canyon Rd., thence westerly on Telegraph Canyon Rd. to NB 805 On-ramp from Telegraph Canyon Rd.

NOTE: When the freeway is closed, place a PCMS (Portable Changeable Message Sign) on NB/805 at a location at the discretion of Construction Field Personnel - warning the public of the closure / detour ahead.

Detour NB 805 for the full Freeway closure for Truck Traffic
 Detour NB 805 traffic via northerly on Rte. 805 to NB 805 Conn. to WB 905, thence westerly on Rte. 905 to WB 905 Conn. to NB 5, thence northerly on Rte. 5 to NB 5 Conn. to EB 54, thence easterly on Rte. 54 to EB 54 Conn. to NB 805.

NOTE: When the freeway is closed, place a PCMS (Portable Changeable Message Sign) on NB/805 at a location at the discretion of Construction Field Personnel - warning the public of the closure / detour ahead.

**Chart no. 5
Complete Freeway/Expressway Closure Hours**

County: SD	Route/Direction: 805/SB	PM: 6.06 - 5.01
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Closure limits: Telegraph Canyon Rd. UC to 0.05 Mi. south of Palomar St. OC

From hour to hour	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Mondays through Thursdays	C	C	C	C	C																				
Fridays	C	C	C	C	C																				
Saturdays																									
Sundays																									

Legend:

- Freeway or expressway may be closed completely
- No complete freeway or expressway closure is allowed

REMARKS:

No other closure that conflicts with or shares any elements of the following detours will be permitted.
 This chart is to be used for a maximum of fifteen (15) nights.
 Seven (7) nights for the demolition of E. Palomar St. OC.
 Eight (8) nights for falsework erection and removal

Detour SB 805 for the full Freeway closure

Detour SB 805 traffic via southerly on Rte. 805 to SB 805 Off-ramp to EB Telegraph Canyon Rd., thence easterly on Telegraph Canyon Rd. to Medical Center Rd., thence southerly on Medical Center Rd./Brandywine Ave. to E. Orange Ave., thence westerly on E. Orange Ave. to SB 805 On-ramp from E. Orange Ave.

NOTE: When the freeway is closed, place a PCMS (Portable Changeable Message Sign) on SB/805 at a location at the discretion of Construction Field Personnel - warning the public of the closure / detour ahead.

Detour SB 805 for the full Freeway closure for Truck Traffic

Detour SB 805 traffic via southerly on Rte. 805 to SB 805 Conn. to WB 54, thence westerly on Rte. 54 to WB 54 Conn. to SB 5, thence southerly on Rte. 5 to SB 5 Conn. to EB 905, thence easterly on Rte. 905 to SB 905 Conn. to SB 805.

NOTE: When the freeway is closed, place a PCMS (Portable Changeable Message Sign) on SB/805 at a location at the discretion of Construction Field Personnel - warning the public of the closure / detour ahead.

Replace "Reserved" in section 12-4.05E with:

Chart no. 6 Complete Ramp Closure Hours																												
County: SD					Route/Direction: 805/NB										PM: 4.587													
Closure limits: NB On-ramp from E. Orange Ave./Olympic Pkwy.																												
From hour to hour																												
	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
Mondays through Thursdays	C	C	C	C	C																				C	C	C	
Fridays	C	C	C	C	C																							
Saturdays				C	C	C	C																					
Sundays				C	C	C	C	C	C																	C	C	C

Legend:

C Ramp may be closed completely

Work allowed within the highway where shoulder or lane closure is not required

REMARKS:

Chart no. 7 Complete Ramp Closure Hours																												
County: SD					Route/Direction: 805/SB										PM: 5.848													
Closure limits: SB On-ramp from Telegraph Canyon Rd.																												
From hour to hour																												
	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
Mondays through Thursdays	C	C	C	C	C																					C	C	C
Fridays	C	C	C	C	C																							
Saturdays				C	C	C	C	C	C	C																		
Sundays				C	C	C	C	C	C	C																C	C	C

Legend:

C Ramp may be closed completely

Work allowed within the highway where shoulder or lane closure is not required

REMARKS:

Replace "Reserved" in section 12-4.05F with:

Chart no. 8 Road Lane Requirements																										
County: SD					Route/Direction: EB/WB "E. Palomar Rd."										PM: 5.06											
Closure limits: At Rte. 805																										
From hour to hour		24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Mondays through Thursdays		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Fridays		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Saturdays		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Sundays		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Legend:																										
X		Street may be closed																								
REMARKS:																										
<p>No other closure that conflicts with or shares any elements of the following detours will be permitted. This chart is to be used for one time only for a maximum of one (1) year for the construction of E. Palomar St. OC</p> <p>Detour EB E. Palomar St. Detour EB E. Palomar St. traffic via easterly on E. Palomar St. to Nacion Ave., thence northerly on Nacion Ave. to E. Naples St., thence easterly on E. Naples St. to Oleander Ave., thence southerly on Oleander Ave. to EB E. Palomar St.</p> <p>Detour WB E. Palomar St. Detour WB E. Palomar St. traffic via westerly on E. Palomar St. to Oleander Ave., thence northerly on Oleander Ave. to E. Naples St., thence westerly on E. Naples St. to Nacion Ave., thence southerly on Nacion Ave. to WB E. Palomar St.</p>																										

**Chart no. 9
Road Lane Requirements**

County: SD	Route/Direction: NB/SB "Nacion Ave."	PM:
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Closure limits: At Nacion Ave./E. Palomar St. Intersection

From hour to hour	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
Mondays through Thursdays	X	X	X	X	X																			X	X	X
Fridays	X	X	X	X	X																					
Saturdays				X	X	X	X	X	X	X	X															
Sundays				X	X	X	X	X	X	X	X													X	X	X

Legend:
 X Street may be closed

REMARKS:

No other closure that conflicts with or shares any elements of the following detours will be permitted.

Detour NB Nacion Ave.
 Detour NB Nacion Ave. traffic via northerly on Nacion Ave. to Pearlwood St./Spruce St., thence westerly on Pearlwood St. to Spruce St., thence westerly on Spruce St. to Melrose Ave., thence northerly on Melrose Ave. to E. Oxford St., thence easterly on E. Oxford St. to NB Nacion Ave.

Detour SB Nacion Ave.
 Detour SB Nacion Ave. traffic via southerly on Nacion Ave. to E. Oxford St., thence westerly on E. Oxford St. to Melrose Ave., thence southerly on Melrose Ave. to Spruce St./Pearlwood St. thence easterly on Spruce St. to Pearlwood St., thence easterly on Pearlwood to SB Nacion Ave.

**Chart no. 10
Road Lane Requirements**

County: SD	Route/Direction: EB/WB "E. Palomar St."	PM:
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Closure limits: At E. Palomar St./Nacion Ave. Intersection

From hour to hour	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
Mondays through Thursdays	X	X	X	X	X																			X	X	X
Fridays	X	X	X	X	X																					
Saturdays				X	X	X	X	X	X	X	X															
Sundays				X	X	X	X	X	X	X	X													X	X	X

Legend:
 X Street may be closed

REMARKS:

No other closure that conflicts with or shares any elements of the following detours will be permitted.

Detour EB E. Palomar St.
 Detour EB E. Palomar St. traffic via easterly on E. Palomar St. to Melrose Ave., thence northerly on Melrose Ave. to E. Naples St., thence easterly on E. Naples St. to Oleander Ave., thence southerly on Oleander Ave. to EB E. Palomar St.

Detour WB E. Palomar St.
 Detour WB. E. Palomar St. traffic via westerly on E. Palomar St. to Oleander Ave., thence northerly on Oleander Ave. to E. Naples St., thence westerly on E. Naples St. to Melrose Ave., thence southerly on Melrose Ave. to WB E. Palomar St.

**Chart no. 11
Road Lane Requirements**

County: SD	Route/Direction: NB/SB "Raven Ave."	PM:
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Closure limits: At Raven Ave./E. Palomar St. Intersection

From hour to hour	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
Mondays through Thursdays	X	X	X	X	X																			X	X	X
Fridays	X	X	X	X	X																					
Saturdays				X	X	X	X	X	X	X	X															
Sundays				X	X	X	X	X	X	X	X													X	X	X

Legend:
 X Street may be closed

REMARKS:

No other closure that conflicts with or shares any elements of the following detours will be permitted.

Detour NB Raven Ave.
 Detour NB Raven Ave. traffic via northerly on Raven Ave. to Sparrow St., thence easterly on Sparrow St. to Oriole Pl., thence northerly on Oriole Pl. to E. Palomar St., thence easterly on E. Palomar St. to Oleander Ave., thence northerly on Oleander Ave. to Redwing Rd., thence westerly on Redwing Rd. to NB Raven Ave.

Detour SB Raven Ave.
 Detour SB Raven Ave. traffic via southerly on Raven Ave. to Redwing Rd., thence easterly on Redwing Rd. to Oleander Ave., thence southerly on Oleander Ave. to E. Palomar St., thence westerly on E. Palomar St. to Oriole Pl., thence southerly on Oriole Pl. to Sparrow St., thence westerly on Sparrow St. to SB Raven Ave.

**Chart no. 12
Road Lane Requirements**

County: SD	Route/Direction: EB/WB "E. Palomar St."	PM:
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Closure limits: At E. Palomar St./Raven Ave. Intersection

From hour to hour	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
Mondays through Thursdays	X	X	X	X	X																			X	X	X
Fridays	X	X	X	X	X																					
Saturdays				X	X	X	X	X	X	X	X															
Sundays				X	X	X	X	X	X	X	X													X	X	X

Legend:
 X Street may be closed

REMARKS:

No other closure that conflicts with or shares any elements of the following detours will be permitted.

Detour EB E. Palomar St.
 Detour EB E. Palomar St. traffic via easterly on E. Palomar St. to Nacion Ave., thence northerly on Nacion Ave. to E. Naples St., thence easterly on E. Naples St. to Oleander Ave., thence southerly on Oleander Ave. to EB E. Palomar St.

Detour WB E. Palomar St.
 Detour WB E. Palomar St. traffic via westerly on E. Palomar St. to Oleander Ave., thence northerly on Oleander Ave. to E. Naples St., thence westerly on E. Naples St. to Nacion Ave., thence southerly on Nacion Ave. to WB E. Palomar St.

**Chart no. 13
Road Lane Requirements**

County: SD	Route/Direction: NB/SB "Raven Ave."	PM:
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Closure limits: Between E. Palomar St. and Thrush St.

From hour to hour	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
Mondays through Thursdays	R	R	R	R	R																			R	R	R
Fridays	R	R	R	R	R																					
Saturdays				R	R	R	R	R	R	R	R															
Sundays				R	R	R	R	R	R	R	R													R	R	R

Legend:

R	Provide at least 1 through traffic lane, not less than 10 feet in width, for use by both directions of travel (Reversing Control)
	Work allowed within the highway where shoulder or lane closure is not required

REMARKS:

NOTE: When Reverse Traffic Control is used.
1. Close one traffic lane and stop public traffic for periods not to exceed ten minutes.

Chart no. 14 Road Lane Requirements																											
County: SD	Route/Direction: NB/SB "Pecan Place"												PM:														
Closure limits: At E. Palomar St.																											
From hour to hour	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
Mondays through Thursdays	R	R	R	R	R																				R	R	R
Fridays	R	R	R	R	R																						
Saturdays				R	R	R	R	R	R	R	R																
Sundays				R	R	R	R	R	R	R	R														R	R	R
Legend:																											
R	Provide at least 1 through traffic lane, not less than 10 feet in width, for use by both directions of travel (Reversing Control)																										
□	Work allowed within the highway where shoulder or lane closure is not required																										
REMARKS:																											
NOTE: When Reverse Traffic Control is used.																											
1. Close one traffic lane and stop public traffic for periods not to exceed ten minutes.																											

**Replace section 12-5 with:
12-5 TRAFFIC CONTROL SYSTEM FOR LANE CLOSURE**

12-5.01 GENERAL

Section 12-5.02 includes specifications for closing traffic lanes, ramps, or a combination, with stationary and moving lane closures on multilane highways and 2-lane, 2-way highways. The traffic control system for a lane closure or a ramp closure must comply with the details shown.

Traffic control system includes signs.

12-5.02 MATERIALS

Vehicles equipped with attenuators must comply with section 12-3.13 of the special provisions.

12-5.03 CONSTRUCTION

12-5.03A General

During traffic striping and pavement marker placement using bituminous adhesive, control traffic with a stationary or a moving lane closure. During other activities, control traffic with stationary lane closures.

Whenever components of the traffic control system are displaced or cease to operate or function as specified from any cause, immediately repair the components to the original condition or replace the components and restore the components to the original location.

12-5.03B Stationary Lane Closures

For a stationary lane closure, ramp closure, or a combination, made only for the work period, remove the components of the traffic control system from the traveled way and shoulder, except for portable delineators placed along open trenches or excavation adjacent to the traveled way at the end of each work period. You may store the components at selected central locations designated by the Engineer within the limits of the highway.

Each vehicle used to place, maintain, and remove components of a traffic control system on a multilane highway must be equipped with a Type II flashing arrow sign that must be in operation whenever the vehicle is being used for placing, maintaining, or removing the components. Vehicles equipped with a Type II flashing arrow sign not involved in placing, maintaining, or removing the components if operated within a stationary-type lane closure must display only the caution display mode. The sign must be controllable by the operator of the vehicle while the vehicle is in motion. If a flashing arrow sign is required for a lane closure, the flashing arrow sign must be operational before the lane closure is in place.

12-5.03C Moving Lane Closures

A changeable message sign used in a moving lane closure must comply with section 12-3.12 except the sign must be truck-mounted. The full operational height to the bottom of the sign may be less than 7 feet above the ground but must be as high as practicable.

A flashing arrow sign used in a moving lane closure must be truck-mounted. Operate the flashing arrow sign in the caution display mode whenever it is being used on a 2-lane, 2-way highway.

12-5.04 PAYMENT

Traffic control system for lane closure is paid for as traffic control system. Flagging costs are paid for as specified in section 12-1.03.

The requirements in section 4-1.05 for payment adjustment do not apply to traffic control system. Adjustments in compensation for traffic control system will be made for an increase or decrease in traffic control work if ordered and will be made on the basis of the cost of the necessary increased or decreased traffic control. The adjustment will be made on a force account basis for increased work and estimated on the same basis in the case of decreased work.

A traffic control system required by change order work is paid for as a part of the change order work.

Replace section 12-8 with:

12-8 TEMPORARY PAVEMENT DELINEATION

12-8.01 GENERAL

Section 12-8 includes specifications for placing, applying, maintaining, and removing temporary pavement delineation.

Painted traffic stripe used for temporary delineation must comply with section 84-3. Apply 1 or 2 coats.

Temporary signing for no-passing zones must comply with section 12-3.06.

12-8.02 MATERIALS

12-8.02A General

Not Used

12-8.02B Temporary Lane Line and Centerline Delineation

Temporary pavement markers must be the same color as the lane line or centerline markers being replaced. Temporary pavement markers must be one of the temporary pavement markers on the Authorized Material List for short-term day or night use, 14 days or less, or long-term day or night use, 180 days or less.

12-8.02C Temporary Edge Line Delineation

Temporary, removable, construction-grade striping and pavement marking tape must be one of the types on the Authorized Material List. Apply temporary, removable, construction-grade striping and pavement marking tape under the manufacturer's instructions.

12-8.03 CONSTRUCTION

12-8.03A General

Whenever work activities obliterate pavement delineation, place temporary or permanent pavement delineation before opening the traveled way to traffic. Place lane line and centerline pavement delineation

for traveled ways open to traffic. On multilane roadways, freeways, and expressways, place edge line delineation for traveled ways open to traffic.

Establish the alignment for temporary pavement delineation, including required lines or markers. Surfaces to receive an application of paint or removable traffic tape must be dry and free of dirt and loose material. Do not apply temporary pavement delineation over existing pavement delineation or other temporary pavement delineation. Maintain temporary pavement delineation until it is superseded or you replace it with a new striping detail of temporary pavement delineation or permanent pavement delineation.

Place temporary pavement delineation on or adjacent to lanes open to traffic for a maximum of 14 days. Before the end of the 14 days, place the permanent pavement delineation. If the permanent pavement delineation is not placed within the 14 days, replace the temporary pavement markers with additional temporary pavement delineation equivalent to the striping detail specified for the permanent pavement delineation for the area. The Department does not pay for the additional temporary pavement delineation.

When the Engineer determines the temporary pavement delineation is no longer required for the direction of traffic, remove the markers, underlying adhesive, and removable traffic tape from the final layer of surfacing and from the existing pavement to remain in place. Remove temporary pavement delineation that conflicts with any subsequent or new traffic pattern for the area.

12-8.03B Temporary Lane Line and Centerline Delineation

Whenever lane lines or centerlines are obliterated, the minimum lane line and centerline delineation must consist of temporary pavement markers placed longitudinally at intervals not exceeding 24 feet. The temporary pavement markers must be temporary pavement markers on the Authorized Material List for short-term day or night use, 14 days or less, or long-term day or night use, 180 days or less. Place temporary pavement markers under the manufacturer's instructions. Cement the markers to the surfacing with the adhesive recommended by the manufacturer, except do not use epoxy adhesive to place pavement markers in areas where removal of the markers will be required.

For temporary lane line or centerline delineation consisting entirely of temporary pavement markers, place the markers longitudinally at intervals not exceeding 24 feet.

Where removal of the white, 4-inch wide, lane line traffic stripe is not required, apply temporary painted traffic stripe and place clear retroreflective pavement markers for temporary lane line delineation. Temporary painted lane line delineation placed on portland cement concrete pavement must consist of a white traffic stripe supplemented by a black-contrast traffic stripe and clear retroreflective pavement markers. Place the temporary painted lane line and clear retroreflective pavement markers longitudinally at intervals not exceeding 48 feet. The black contrast stripe and clear retroreflective pavement markers may remain in place at locations where you will be placing permanent pavement delineation.

12-8.03C Temporary Edge Line Delineation

Whenever edge lines are obliterated on multilane roadways, freeways, and expressways, place edge line delineation for that area adjacent to lanes open to traffic consisting of (1) solid, 4-inch wide traffic stripe tape of the same color as the stripe being replaced, (2) traffic cones, (3) portable delineators or channelizers placed longitudinally at intervals not exceeding 100 feet. You may apply temporary painted traffic stripe where removal of the 4-inch wide traffic stripe will not be required.

The Engineer determines the lateral offset for traffic cones, portable delineators, and channelizers used for temporary edge line delineation. If traffic cones or portable delineators are used for temporary pavement delineation for edge lines, maintain the cones or delineators during hours of the day when the cones or delineators are being used for temporary edge line delineation.

Channelizers used for temporary edge line delineation must be an orange surface-mounted type. Cement channelizer bases to the pavement as specified in section 85 for cementing pavement markers to pavement except do not use epoxy adhesive to place channelizers on the top layer of the pavement. Channelizers must be one of the 36-inch, surface-mounted types on the Authorized Material List.

Remove the temporary edge line delineation when the Engineer determines it is no longer required for the direction of traffic.

12-8.04 PAYMENT

Not Used

AA

13 WATER POLLUTION CONTROL

Add to section 13-3.01A:

The project is risk level 2.

Replace 1st paragraph of section 13-6.03C with:

Provide temporary drainage inlet protection around drainage inlets as changing conditions require. Drainage inlet protection must be Type 2, Type 3A, Type 3B, or Type 5, as appropriate for conditions around the drainage inlet.

Add to section 13-10.03A:

You may place gravel-filled bags within a shoulder area without Type K temporary railing under any of the following conditions:

1. The section of roadway with the shoulder is not open to public traffic.
2. The gravel-filled bags are;
 - 2.1. Beyond 30 feet from the edge of traveled way for freeways and expressways, or
 - 2.2. Beyond 20 feet from the edge of traveled way for conventional highways.
3. The gravel-filled bags on the shoulder are within a temporary lane closure and the bags are removed prior to the lane closure being removed.

AA

14 ENVIRONMENTAL STEWARDSHIP

Add to section 14-1.02:

An ESA exists on this project.

Before start of work, protect the ESA by installing temporary fence (Type ESA).

Limited access to the ESA is allowed for water quality sampling. Notify the Engineer 1 business day before the planned entry date. Any other access to an ESA is prohibited.

Night lighting must be shielded and/or directed away from the ESA.

Replace section 14-6.02 with:

14-6.02 SPECIES PROTECTION

14-6.02A General

Section 14-6.02 includes specifications for protecting regulated species or their habitat.

14-6.02B Material

Not Used

14-6.02C Construction

14-6.02C(1) General

Not Used

14-6.02C(2) Protective Radius

Reserved

14-6.02C(3) Protocols

Reserved

14-6.02C(4) Biological Resource Information

Reserved

14-6.02C(5) Protection Measures

Within the project, implement the following protection measures:

1. Notify the Engineer 15 days prior to vegetation or earth disturbing activities.
2. A Biologist will be provided for monitoring of migratory and nongame birds.
3. Contractor must provide access to the Biologist to conduct monitoring.

14-6.02C(6) Monitoring Schedule

Reserved

14-6.02D Payment

Not Used

Replace 3rd paragraph of section 14-6.03A with:

The Department anticipates nesting or attempted nesting by migratory and nongame birds from:

1. Within upland habitat from February 15 to August 31.
2. Within wetland habitat from March 15 to July 15.

Replace item 1 in the list in the 7th paragraph of section 14-6.03A with:

Stop all work within a 100-foot radius of the discovery except as shown in the following table:

Radius Exceptions	
Species	Work stoppage radius (feet)
General Migratory Bird	50
California gnatcatcher	200

Replace section 14-6.08 with:

14-6.08 BIOLOGICAL RESOURCE INFORMATION PROGRAM

14-6.08A General

14-6.08A(1) Summary

Section 14-6.08 includes specifications for preparing and presenting a Biological Resource Information Program to familiarize construction staff with regulated species and related requirements.

United States Fish and Wildlife Service Biological Opinion requires a Biological Resource Information Program to ensure that all the Contractor's personnel are fully informed of the biological sensitivities associated with this project.

A Biologist will be provided by the State to present a 2-hour Biological Resource Information Program to all the Contractor's personnel at the first scheduled safety meeting held by the Contractor's Project Manager, or as agreed upon by the Engineer and the Contractor.

14-6.08A(2) Submittals

Notify the Engineer of scheduled training classes at least 7 days before the 1st training class.

Provide the Engineer with an attendance list including the printed and signed name of each attendee of the Biological Resource Information Program. Provide the Engineer with the attendance list within 2 working days following each environmental education session. Submit a separate attendance list for each subsequent session for new workers.

14-6.08B Materials

Not Used

14-6.08C Construction

Workers must receive Biological Resource Information training before performing on-site work. Workers include laborers, tradesmen, material suppliers, equipment maintenance personnel, supervisors, foremen, office personnel, food vendors, and other personnel who stay on the project longer than 2 hours.

The Biological Resource Information Program includes:

1. Description of regulated species that may be affected by construction
2. Requirements for the protection of regulated species
3. Definition and consequences of "take"
4. What to do when you see a regulated species or a species that looks like a regulated species
5. Identification of work area and ESA
6. Description of avoidance and minimization measures
7. PLAC requirements
8. Description and general ecology of the regulated species
9. Description of specific habitats used by the regulated species and their location

10. Handout to implement species protection measures that describe species, habitats, and actions as listed in section 14-6.02 or in PLACs

The Department is providing handout materials for regulated species as specified in section 2-1.06B.

14-6.08D Payment

Not Used

Replace "Reserved" in section 14-7.03 with:

14-7.03 PALEONTOLOGICAL RESOURCES

14-7.03A General

14-7.03A(1) Summary

Section 14-7.03 includes specifications for coordinating and cooperating with Department provided paleontological resources monitoring.

The Department will perform paleontological monitoring and salvage during construction operations and related activities involving subsurface disturbance under California Public Resources Code Section 5097.5 and the California Environmental Quality Act (CEQA). The Department will provide a Paleontological Mitigation Team consisting of a qualified Principal Paleontologist and Paleontological Monitors. The Engineer will make arrangements for the Paleontological Mitigation Team to be at the job site.

All paleontological specimens within the highway are and remain the property of the Department once excavated.

14-7.03A(2) Submittals

Submit a schedule of subsurface disturbing activities at least 15 days before construction. Submit schedule updates at least 3 business days before implementing changes.

Submit a request for paleontological awareness training 10 days before the start of work.

14-7.03A(3) Quality Control and Assurance

Attend a pre-construction meeting with the Paleontological Mitigation Team and the Engineer to establish procedures for cooperation and worker safety during monitoring and salvage activities.

All employees, subcontractors, and Contractor's representatives on the job site involved in subsurface disturbing activities must receive a one-hour paleontological resource awareness training program provided by the Paleontological Mitigation Team before performing work at the job site.

14-7.03B Materials

Not Used

14-7.03C Construction

14-7.03C(1) General

Within the boundaries of the project area, no construction or related activities, which may involve subsurface disturbance, are permitted without authorization.

Notify the Engineer 15 days before start of subsurface disturbing activities.

The Paleontological Salvage Team will monitor and salvage appropriate fossil specimens identified during excavation. The Engineer may temporarily divert or stop construction operations in the vicinity of a paleontological find or notify you of the need to avoid disturbing an area pending removal of fossil specimens.

14-7.03D Payment

Any additional excavation required due to discovery of paleontological remains, required of you by the Paleontological Salvage Team is change order work.

Replace the 1st paragraph of section 14-8.02 with:

Do not exceed 86 dBA LMax at 50 feet from the job site activities from 9 p.m. to 6 a.m. except you may perform the following activities during the hours and for the days shown in the following table:

Noise Restriction Exceptions

Activity	Hours		Days	
	From	To	From	Through
Bridge Demolition	2400	0400	Monday	Friday
Concrete Barrier Demolition	Lanes 2100	Lanes 0400	Sunday	Thursday
Concrete Pumping	Lanes 0300	Lanes 0800	Sunday	Sunday
Cold Plane AC Pavement	Ramps 2130	Ramps 0500	Sunday	Thursday
Grind Existing Concrete	Ramps 0300	Ramps 0700	Saturday	Saturday
Pavement	Ramps 0300	Ramps 0900	Sunday	Sunday
PCC Paving				
HMA Paving				

Add to section 14-8.02:

Provide one Type 1 sound level meter and 1 acoustic calibrator to be used by the Department until Contract acceptance. Provide training by a person trained in noise monitoring to 1 Department employee designated by the Engineer. The sound level meter must be calibrated and certified by the manufacturer or other independent acoustical laboratory before delivery to the Department. Provide annual recalibration by the manufacturer or other independent acoustical laboratory. The sound level meter must be capable of taking measurements using the A-weighting network and the slow response settings. The measurement microphone must be fitted with a windscreen. The Department returns the equipment to you at Contract acceptance. Work specified in this paragraph is paid for as noise monitoring.

Replace section 14-11.07 with:

14-11.07 REMOVE YELLOW TRAFFIC STRIPE AND PAVEMENT MARKING WITH HAZARDOUS WASTE RESIDUE

14-11.07A General

14-11.07A(1) Summary

Section 14-11.07 includes specifications for removing existing yellow thermoplastic and yellow painted traffic stripe and pavement marking. The residue from the removal of this material is a Department-generated hazardous waste.

Residue from removal of yellow thermoplastic and yellow painted traffic stripe and pavement marking contains lead chromate. The average lead concentration is at least 1,000 mg/kg total lead or 5 mg/l soluble lead. When applied to the roadway, the yellow thermoplastic and yellow painted traffic stripe and pavement marking contained as much as 2.6 percent lead. Residue produced from the removal of this yellow thermoplastic and yellow painted traffic stripe and pavement marking contains heavy metals in concentrations that exceed thresholds established by the Health & Safety Code and 22 CA Code of Regs. For bidding purposes, assume the residue is not regulated under the Federal Resource Conservation and Recovery Act (RCRA), 42 USC § 6901 et seq.

Work associated with disposal of hazardous waste residue regulated under RCRA as determined by test results is change order work.

Yellow thermoplastic and yellow paint may produce toxic fumes when heated.

14-11.07A(2) Submittals

14-11.07A(2)(a) General

Reserved

14-11.07A(2)(b) Lead Compliance Plan

Submit a lead compliance plan under section 7-1.02K(6)(j)(ii).

14-11.07A(2)(c) Work Plan

Submit a work plan for the removal, containment, storage, and disposal of yellow thermoplastic and yellow painted traffic stripe and pavement marking. The work plan must include:

1. Objective of the operation
2. Removal equipment
3. Procedures for removal and collection of yellow thermoplastic and yellow painted traffic stripe and pavement marking residue, including dust
4. Type of hazardous waste storage containers
5. Container storage location and how it will be secured
6. Hazardous waste sampling protocol and QA/QC requirements and procedures
7. Qualifications of sampling personnel
8. Analytical lab that will perform the analyses
9. DTSC registration certificate and CA Highway Patrol (CHP) Biennial Inspection of Terminals (BIT) Program compliance documentation of the hazardous waste hauler that will transport the hazardous waste
10. Disposal site that will accept the hazardous waste residue

The Engineer will review the work plan within 5 business days of receipt.

Do not perform work that generates hazardous waste residue until the work plan has been authorized.

Correct any rejected work plan and resubmit a corrected work plan within 5 business days of notification by the Engineer. A new review period of 5 business days will begin from date of resubmittal.

14-11.07A(2)(d) Analytical Test Results

Submit analytical test results of the residue from removal of yellow thermoplastic and yellow painted traffic stripe and pavement marking, including chain of custody documentation, for review and acceptance before:

1. Requesting the Engineer's signature on the waste profile requested by the disposal facility
2. Requesting the Engineer obtain an US EPA Generator Identification Number for disposal
3. Removing the residue from the site

14-11.07A(2)(e) U.S. Environmental Protection Agency Identification Number Request

Submit a request for the US EPA Generator Identification Number when the Engineer accepts analytical test results documenting that residue from removal of yellow thermoplastic and yellow painted traffic stripe and pavement marking is a hazardous waste.

14-11.07A(2)(f) Disposal Documentation

Submit documentation of proper disposal from the receiving landfill within 5 business days of residue transport from the project.

14-11.07B Materials

Not Used

14-11.07C Construction

Where grinding or other authorized methods are used to remove yellow thermoplastic and yellow painted traffic stripe and pavement marking that will produce a hazardous waste residue, immediately contain and collect the removed residue, including dust. Use a HEPA filter-equipped vacuum attachment operated concurrently with the removal operations or other equally effective approved methods for collection of the residue.

Make necessary arrangements to test the yellow thermoplastic and yellow paint hazardous waste residue as required by the disposal facility and these special provisions. Testing must include:

1. Total lead by US EPA Method 6010B
2. Total chromium by US EPA Method 6010B
3. Soluble lead by California Waste Extraction Test (CA WET)
4. Soluble chromium by CA WET

5. Soluble lead by Toxicity Characteristic Leaching Procedure (TCLP)
6. Soluble chromium by TCLP

From the first 220 gal of hazardous waste or portion thereof if less than 220 gal of hazardous waste are produced, a minimum of 4 randomly selected samples must be taken and analyzed individually. Samples must not be composited. From each additional 880 gal of hazardous waste or portion thereof if less than 880 gal are produced, a minimum of 1 additional random sample must be taken and analyzed. Use chain of custody procedures consistent with chapter 9 of US EPA Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846) while transporting samples from the project to the laboratory. Each sample must be homogenized before analysis by the laboratory performing the analyses. A sample aliquot sufficient to cover the amount necessary for the total and the soluble analyses must then be taken. This aliquot must be homogenized a 2nd time and the total and soluble analyses run on this aliquot. The homogenization process must not include grinding of the samples. Submit the name and location of the disposal facility that will be accepting the hazardous waste and the analytical laboratory along with the testing requirements not less than 5 business days before the start of removal of yellow thermoplastic and yellow painted traffic stripe and pavement marking. The analytical laboratory must be certified by the California Department of Public Health (CDPH) Environmental Laboratory Accreditation Program (ELAP) for all analyses to be performed.

After the Engineer accepts the analytical test results, dispose of yellow thermoplastic and yellow paint hazardous waste residue at a Class 1 disposal facility located in California under the requirements of the disposal facility operator within 30 days after accumulating 220 pounds of residue and dust.

If less than 220 pounds of hazardous waste residue and dust is generated in total, dispose of it within 90 days after the start of accumulation of the residue and dust.

The Engineer will sign all manifests as the generator within 2 business days of receiving and accepting the analytical test results and receiving your request for the US EPA Generator Identification Number. Use a transporter with a current DTSC registration certificate and that is in compliance with the CHP BIT Program when transporting hazardous waste.

14-11.07D Payment

Payment for a lead compliance plan is not included in the payment for environmental stewardship work.

If analytical test results demonstrate that the residue is a non-hazardous waste and the Engineer agrees, dispose of the residue at an appropriately permitted CA Class II or CA Class III facility. The Department does not adjust payment for this disposal.

Replace section 14-11.09 with:

14-11.09 TREATED WOOD WASTE

14-11.09A General

14-11.09A(1) Summary

Section 14-11.09 includes specifications for handling, storing, transporting, and disposing of treated wood waste (TWW).

Wood removed from metal beam guard railing, fence and roadside signs is TWW. Manage TWW under 22 CA Code of Regs, Div. 4.5, Chp. 34.

14-11.09A(2) Submittals

For disposal of TWW, submit as an informational submittal a copy of each completed shipping record and weight receipt within 5 business days.

14-11.09B Materials

Not Used

14-11.09C Construction

14-11.09C(1) General

14-11.09C(2) Training

Provide training to personnel who handle TWW or may come in contact with TWW. Training must include:

1. All applicable requirements of 8 CA Code of Regs
2. Procedures for identifying and segregating TWW
3. Safe handling practices
4. Requirements of 22 CA Code of Regs, Div. 4.5, Chp. 34
5. Proper disposal methods

Maintain records of personnel training for 3 years.

14-11.09C(3) Storage

Store TWW before disposal using the following methods:

1. Elevate on blocks above a foreseeable run-on elevation and protect from precipitation for no more than 90 days.
2. Place on a containment surface or pad protected from run-on and precipitation for no more than 180 days.
3. Place in water-resistant containers designed for shipping or solid waste collection for no more than 1 year.
4. Place in a storage building as defined in 22 CA Code of Regs, Div. 4.5, Chp. 34, § 67386.6(a)(2)(C).

Prevent unauthorized access to TWW using a secured enclosure such as a locked chain link fenced area or a lockable shipping container located within the job site.

Resize and segregate TWW at a location where debris from the operation including sawdust and chips can be contained. Collect and manage the debris as TWW.

Provide water-resistant labels that comply with 22 CA Code of Regs, Div. 4.5, Chp. 34, §67386.5, to clearly mark and identify TWW and accumulation areas. Labels must include:

1. Caltrans, District number, Construction, Construction Contract number
2. District office address
3. Engineer's name, address, and telephone number
4. Contractor's contact name, address and telephone number
5. Date placed in storage

14-11.09C(4) Transporting and Disposal

Before transporting TWW, obtain an agreement from the receiving facility that the TWW will be accepted. Protect shipments of TWW from loss and exposure to precipitation. For projects with 10,000 pounds or more of TWW, request a US EPA Generator Identification Number from the Engineer at least 5 business days before the first shipment. Each shipment must be accompanied by a shipping record such as a bill of lading or invoice that includes:

1. Caltrans with district number
2. Construction Contract number
3. District office address
4. Engineer's name, address, and telephone number
5. Contractor's contact name and telephone number
6. Receiving facility name and address
7. Waste description: Treated Wood Waste with preservative type if known or unknown/mixture
8. Project location
9. Estimated quantity of shipment by weight or volume
10. Date of transport
11. Date of receipt by the receiving TWW facility
12. Weight of shipment as measured by the receiving TWW facility
13. For projects with 10,000 pounds or more of TWW include the USA EPA Generator Identification Number.

1. Construct a temporary HMA taper to the level of the existing pavement
2. Place HMA during the next work shift
3. Submit a corrective action plan that shows you will complete cold planing and placement of HMA in the same work shift. Do not restart cold planing activities until the Engineer approves the corrective action plan.

15-2.02B(3)(b) Materials

Use the same quality of HMA for temporary tapers that is used for the HMA overlay or comply with the specifications for minor HMA in section 39.

15-2.02B(3)(c) Construction

15-2.02B(3)(c)(i) General

Do not use a heating device to soften the pavement.

The cold planing machine must be:

1. Equipped with a cutter head width that matches the planing width. If the cutter head width is wider than the cold plane area shown, submit to the Engineer a request for using a wider cutter head. Do not cold plane unless the Engineer approves your request.
2. Equipped with automatic controls for the longitudinal grade and transverse slope of the cutter head and:
 - 2.1. If a ski device is used, it must be at least 30 feet long, rigid, and a 1-piece unit. The entire length must be used in activating the sensor.
 - 2.2. If referencing from existing pavement, the cold planing machine must be controlled by a self-contained grade reference system. The system must be used at or near the centerline of the roadway. On the adjacent pass with the cold planing machine, a joint-matching shoe may be used.
3. Equipped to effectively control dust generated by the planing operation
4. Operated so that no fumes or smoke is produced.

Replace broken, missing, or worn machine teeth.

15-2.02B(3)(c)(ii) Grade Control and Surface Smoothness

Furnish, install, and maintain grade and transverse slope references.

The depth, length, width, and shape of the cut must be as shown or as ordered. The final cut must result in a neat and uniform surface. Do not damage the remaining surface.

The completed surface of the planed asphalt concrete pavement must not vary more than 0.02 foot when measured with a 12-foot straightedge parallel with the centerline. With the straightedge at right angles to the centerline, the transverse slope of the planed surface must not vary more than 0.03 foot.

Where lanes are open to traffic, the drop-off of between adjacent lanes must not be more than 0.15 foot.

15-2.02B(3)(c)(iii) Temporary HMA Tapers

If a drop-off between the existing pavement and the planed area at transverse joints cannot be avoided before opening to traffic, construct a temporary HMA taper. The HMA temporary taper must be:

1. Placed to the level of the existing pavement and tapered on a slope of 30:1 (horizontal:vertical) or flatter to the level of the planed area
2. Compacted by any method that will produce a smooth riding surface

Completely remove temporary tapers before placing permanent surfacing.

15-2.02B(3)(c)(iv) Remove Planed Material

Remove cold planed material concurrent with planing activities so that removal does not lag more than 50 feet behind the planer.

15-2.02B(3)(d) Payment

Payment for removal of pavement markers, thermoplastic traffic stripe, painted traffic stripe, and pavement marking within the area of cold planing is included in the payment for cold plane asphalt concrete pavement of the types shown in the Bid Item List.

Replace section 15-2.02C(2) with:

15-2.02C(2) Remove Traffic Stripes and Pavement Markings Containing Lead

Residue from removing traffic stripes and pavement markings contains lead from the paint or thermoplastic. The average lead concentrations are less than 1,000 mg/kg total lead and 5 mg/L soluble lead. This residue:

1. Is a nonhazardous waste
2. Does not contain heavy metals in concentrations that exceed thresholds established by the Health and Safety Code and 22 CA Code of Regs
3. Is not regulated under the Federal Resource Conservation and Recovery Act (RCRA), 42 USC § 6901 et seq.

Submit a lead compliance plan under section 7-1.02K(6)(j)(ii).

Payment for a lead compliance plan is not included in the payment for existing facilities work.

Payment for handling, removal, and disposal of pavement residue that is a nonhazardous waste is included in the payment for the type of removal work involved.

Replace section 15-2.02I with:

15-2.02I Remove Sign Structures

Removing overhead sign structures includes removal of:

1. Frames, braces, supports, and brackets
2. Portions of foundations
3. Sign panels
4. Mounting hardware for light fixtures
5. Walkways, safety railing, gutter
6. Electrical equipment for sign lighting
7. Hardware
8. Posts
9. Portions of foundations

Concrete foundations may be abandoned in place except that the top portion, including anchor bolts, reinforcing steel, and conduits, must be removed to a depth of not less than 3 feet below the adjacent finished grade. The resulting holes must be backfilled and compacted with material that is equivalent to the surrounding material.

Removing bridge mounted sign structures includes removal of:

1. Frames, braces, supports, and brackets
2. Portions of foundations
3. Sign panels
4. Mounting hardware for light fixtures
5. Walkways, safety railing, and gutter
6. Electrical equipment for sign lighting
7. Hardware

Remove signs' conduit and wiring to the nearest pull box. Remove fuses within spliced connections in the pull box.

Replace section 15-2.02M with:

15-2.02M Remove Water Meter

Remove water meters at the locations shown.

The Otay Water District will remove water meters. Make the arrangements with the Otay Water District to remove the water meters. There is no fee from the Otay Water District for removing a water meter.

Replace section 15-2.03A(2)(b) with:

15-2.03A(2)(b) Department Salvage Location

A minimum of 2 business days before hauling salvaged material to the Department salvage storage location, notify:

1. Engineer
2. City of Chula Vista public works center at telephone number (619) 397-6163

For irrigation facilities, the Department salvage storage location is:

Kearny Mesa Construction Field Office
7177 Opportunity Rd, San Diego, CA, 92111

Salvage storage location for electrical facilities is:

City of Chula Vista, Traffic Operations
1800 Maxwell Road, Chula Vista, CA 91911

Replace section 15-2.03A(4) with:

15-2.03A(4) Payment

Payment for salvaging irrigation facilities is included in the payment for remove irrigation facility.

Payment for salvaging electrical facilities is included in the payment for the system work involved.

Replace section 15-2.03C with:

15-2.03C Salvage Irrigation Facilities

For irrigation facilities that are shown to be removed, salvage the following items:

1. Sprinklers
2. Remote control valves
3. Gate valves
4. Backflow preventer assembly and enclosure
5. Irrigation controllers and controller enclosure cabinets

Add to section 15-4.01C(1):

Remove the following bridge:

Bridge no.	Description of work
Br. No. 57-0861	Completely remove the Palomar Street Overcrossing

Replace item 4 of the 1st paragraph in section 15-4.01C(2)(b) with:

4. Provide the openings specified in section 12-4 except that when no openings are specified for bridge removal provide a vertical opening of 15 feet and a horizontal opening of 61 feet for public traffic.

Add to section 20-1.03B:

Growth regulators must not be used.

Replace section 20-2.03D with:

20-2.03D Maintain Existing Planted Areas

Maintain existing planted areas as ordered. Maintain existing planted areas is change order work.

Replace section 20-3.01C(3) with:

20-3.01C(3) Control and Neutral Conductors Schedule of Values

Submit a schedule of values for control and neutral conductors. Submit the schedule after the wiring plans and diagrams for the electrical components of the irrigation system, except electrical service, have been authorized.

The unit descriptions shown in the table are the minimum. You may include additional unit descriptions. Include the quantity, value, and amount for those additional unit descriptions.

Use the authorized wiring plan and diagrams to determine the quantities required to complete the work.

No adjustment in compensation is made in the contract lump sum price paid for control and neutral conductors work due to differences between the quantities shown in the schedule of values for control and neutral conductors work and the quantities required to complete the work.

Schedule of Values for Control and Neutral Conductors

Contract no. 11-2T1824				
Unit description	Unit	Approximate quantity	Value	Amount
__ AWG (UF) conductors (provide size)	LF			
__ AWG (UF) conductors	LF			
__ AWG (UF) conductors	LF			
No. 5 or larger pull box	EA			
Splices	EA			
__ Sprinkler control conduit (provide size)	LF			
__ Sprinkler control conduit	LF			
__ Sprinkler control conduit	LF			

Total _____

Add to section 20-3.02E:

20-3.02E(5) Sprinkler Control Conduit

Sprinkler control conduit must comply with section 20-3.02E(3).

Add to section 20-3.02:

20-3.02M(4)(a) Recycled Water Detectable Warning Tape

Detectable warning tape used to mark pressurized recycled water main supply lines must:

1. Be minimum 5 mil overall thickness.
2. Be solid aluminum foil core
3. Be multiple layer laminate construction.
4. Be purple in color and permanently marked with "Caution Reclaimed Water Line Buried Below."
5. Be minimum 3 inches wide and detectable at the depths required for the main supply line installation.

Add to section 20-3.02N:

Posts and fastening hardware for post mounted recycled water warning signs must comply with section 56-4.

Replace the 2nd sentence of the 3rd paragraph of section 20-3.02P(2) with:

Color of drain grate must be gray.

Replace the 4th paragraph of section 20-3.02P(2) with:

Pea gravel for filling the drainpipe must have a maximum diameter of 1/2 inch. Pea gravel must be naturally rounded aggregate, clean, washed, dry and free from clay or organic material.

Add to section 20-3.02R(1):

Ball valves must be 2-piece brass or bronze body.

Add to section 20-3.02R(3)(b):

Remote control valves must be brass.

Add to paragraph 2 of section 20-3.02R(3)(b):

8. Be equipped with a self-flushing feature manufactured to be used with recycled water. Valves must not have external tubing.
9. Have one piece solenoids with plunger and spring secured to the solenoid.
10. Have purple flow control handles.

Add to section 20-3.02R(3)(b):

Valves must be straight pattern as shown.

Replace the 3rd sentence of the last paragraph in section 20-3.02R(5) with:

Pipe flanges used to connect plastic or metal pipe to gate valves must be metal.

Replace the last sentence of the 6th paragraph in section 20-3.02U with:

Label material must be plate plastic.

Replace section 20-3.02V with:

20-3.02V Water Meters

Water meters for the irrigation systems are furnished and installed by the servicing utility at the locations shown.

Make the arrangements and pay the costs and fees required by the servicing utility.

Make the arrangements and pay the costs and fees required by the servicing utility for furnishing and installing each water meter. Fees and costs include:

1. Water meter
2. All labor, materials and equipment necessary

Furnish and install the following not covered by the fees charged by the servicing utility:

1. Connection to servicing utility water line including hot tap or tee as required
2. Pipe extension from the servicing utility water line to Department's property line
3. All labor, materials and equipment necessary

The Otay Water District has established a fee of \$4,017.00 for furnishing and installing a 2 inch water meter. If, at the time of installation, this fee has changed, the Department takes a credit for the reduction in the fee, or the Department pays the difference for the increase in the fee. The credit or payment is

taken or paid on the 1st monthly progress payment made after the meter is installed. Submit a copy of the invoice for the installation fee.

Make arrangements for furnishing and applying water until the water meters have been installed by the servicing utility.

Add to section 20-3.02:

20-3.02X Recycled Water Connection Assembly and Enclosure

Recycled water connection assembly includes basket strainer, pressure regulating valve, check valve concrete pad, enclosure, pipe and fittings as shown.

Basket strainer must:

1. Be constructed of bronze.
2. Have a threaded drain plug.
3. Have a stainless steel basket with a solid bottom and an integral handle for removal.
4. Have a filtration equivalent of 80 mesh.
5. Have flanged connections on the inlet and outlet.
6. Have a cover that attaches to the body with stainless steel bolts.

Pressure regulating valve must comply with section 20-3.02R(6).

Check valve must be one of the following or equal:

1. Watts Series CV
2. Hammond Model 967
3. Milwaukee Valve Model 509

Concrete must comply with section 20-3.02D.

Enclosure must comply with section 20-3.02B(4).

Pipe and fittings must be seamless Red Brass and comply with ASTM B43-09.

Add to section 20-3.03F(3):

Plastic pipe supply line mains must be installed not less than 1.5 feet below finished grade measured to the top of the pipe.

Replace "Reserved" in section 20-3.03F(6) with:

Place detectable warning tape on top of the pipe, along the centerline and run continuously along the entire length of pipe prior to placement of trench backfill.

Secure detectable warning tape to the pipe at 5 foot intervals with plastic adhesive tape, duct tape or plastic tie straps.

Test detectable warning tape at locations designated by the Engineer. Test locations must be backfilled a minimum of 12" to facilitate testing. After detectable warning tape has been successfully tested trench backfill can be completed.

Replace the 5th paragraph of section 20-3.03N with:

Pipe supply lines on the discharge side of the valve must be tested in conformance with Method B only. Testing by Method A is not allowed.

Pipelines installed by trenching and backfilling and pipelines that are completely visible after installation must be tested by Method B. All other pipelines, including those installed in the ground by methods other than trenching and backfilling must be tested by Method A.

Recycled water supply lines (main) must be tested in conformance with Method A and be performed at 150 PSI.

Replace the 1st sentence in section 20-3.03P with:

Functional tests within the Chula Vista and Metropolitan Transit System areas must be satisfactorily completed before:

Add to section 20-3.04:

Payment for detectable warning tape is included in the payment for the various types and sizes of plastic pipe supply lines.

Replace the 15th paragraph in section 20-3.04 with:

Electrical conduit, sprinkler control conduit, and pull boxes are measured and paid for as control and neutral conductors.

Replace "Reserved" in section 20-5 with:

20-5.01 GENERAL

20-5.01A Summary

Section 20-5 includes specifications for installing remote irrigation control system equipment.

20-5.01B Definitions

CCU: Cluster control unit

RICS: Remote irrigation control system

SAT: Satellite controller

20-5.01C Submittals

20-5.01C(1) Product Data

Submit the manufacturer's descriptive and technical literature for all materials.

20-5.01C(2) Manufacturer's Instructions

Five business days before starting installation, submit the manufacturer's written instructions for flow sensors.

20-5.01C(3) Maintenance and Operations Manuals

Comply with section 20-3.01C(8).

20-5.02 MATERIALS

20-5.02A Irrigation Controllers

The irrigation controllers within Department highway areas must be Rain Bird Maxicom controllers and must communicate by local two-way radio from CCU to controllers. Communication from CCU to the central computer must be by dial-up phone service.

You may obtain the specified equipment listed below from:

Rain Bird Services Corporation
6991 East Southpoint Road
Tucson, AZ 85756
(800) 444-5756.

The quoted prices and equipment are as follows (excluding sales tax and delivery):

Equipment Description	Quoted Price	Quantity Each	Extended Price	Controller Identification
24 Station ESP Satellite Irrigation Controllers, Model No. EL24W. 36" High x 24" Wide x 12" Deep Stainless Steel Front Opening Cabinet, Model No. Maxi-PEDS-1-P4. Satellite Verification, Model No. MULTI-SATVRF. Model 3002 Flow Monitor with Power Supply and Nema Cab, Model No. FM. Polyphaser Surge Protection, Model No. LPPH. Low Voltage Phone Surge Protection with Removable Inserts, Model No. SPP. Omni Directional Antenna (Link 450-470 MHz) with 30' of RG58 Coaxial Cable, Model No. ANT05. Narrowband Radio modem Kit (450-470 MHz), Model No. RMK450NARR.	\$8,208.45	1	\$8,208.45	SAT '40 (E)'
40 Station ESP Satellite Irrigation Controllers, Model No. EL40W. 36" High x 24" Wide x 12" Deep Stainless Steel Front Opening Cabinet, Model No. Maxi-PEDS-1-P4. Satellite Verification, Model No. MULTI-SATVRF. Model 3002 Flow Monitor with Power Supply and Nema Cab, Model No. FM. Polyphaser Surge Protection, Model No. LPPH. Low Voltage Phone Surge Protection with Removable Inserts, Model No. SPP. Omni Directional Antenna (Link 450-470 MHz) with 30' of RG58 Coaxial Cable, Model No. ANT05. Narrowband Radio modem Kit (450-470 MHz), Model No. RMK450NARR.	\$9,421.45	1	\$9,421.4500	SAT '40 (F)'

Prices are good until 05/23/2013.

The irrigation controllers within the Chula Vista and Metropolitan Transit System areas must be Rain Master Eagle PLUS controllers and must communicate by two-way cellular communication between user and an internet based site.

You may obtain the specified equipment listed below from:

John Deere Green Tech
3 Chrysler, Irvine, CA 92618
(949) 455-7465.

The quoted prices and equipment are as follows (excluding sales tax and delivery):

Equipment Description	Quoted Price	Quantity Each	Extended Price	Controller Identification
Rain Master Eagle PLUS 32 station controller with I-Central Card Antenna, Top Entry Enclosure and 2-year service plan, Model No. SA6-RM2-32. Additional 5-year I-Central Service Plan, Model No. 5YR. Rain Master Bronze Flow Sensor, 1-1/2" size, Model No. FSF-150B. Promax Transmitter and permanent mount receiver and antenna, Model No. PMR.	\$10,931.30	1	\$10,931.30	SAT 'D'
Rain Master Eagle PLUS 16 station controller with I-Central Card Antenna, Top Entry Enclosure and 2-year service plan, Model No. SA6-RM2-16. Additional 5-year I-Central Service Plan, Model No. 5YR. Rain Master Bronze Flow Sensor, 1" size, Model No. FSF-100B. Promax Transmitter and permanent mount receiver and antenna, Model No. PMR-CAC.	\$8,620.95	1	\$8,620.95	SAT 'V'
Rain Master Eagle PLUS 48 station controller with I-Central Card Antenna, Top Entry Enclosure and 2-year service plan, Model No. SA6-RM2-48. Additional 5-year I-Central Service Plan, Model No. 5YR. Promax permanent mount receiver and antenna, Model No. PMR-CAC.	\$10,879.75	1	\$10,879.75	SAT 'M'
Rain Master Eagle PLUS 32 station controller with I-Central Card Antenna, Top Entry Enclosure and 2-year service plan, Model No. SA6-RM2-32. Additional 5-year I-Central Service Plan, Model No. 5YR. Rain Master Bronze Flow Sensor, 2" size, Model No. FSF-200B. Promax permanent mount receiver and antenna, Model No. PMR-CAC.	\$10,377.30	1	\$10,377.30	SAT 'N'

Prices are good until 05/24/2013.

20-5.02B Antenna Mast

Antenna mast includes galvanized steel pole, SCH 80 PVC pipe, Omni Directional Antenna and coaxial cable, conduit, fittings, straps, and sealant.

The pole must be galvanized steel pipe and comply with section 20-3.02M(2).

20-5.02C Flow Sensor

Flow sensor includes flow sensor, valve box with wire mesh and gravel or crushed rock, fittings, pipe, flow sensor cable and conduit.

Flow sensor must be Rain Bird Model No. FS300P, Part No. M80104.

The quoted price for the flow sensor is \$375.19 each (excluding tax and freight).

You may obtain the flow sensors from:

Rain Bird Services Corporation
6991 East Southpoint Road, Tucson, Arizona 85756
(888) 444-5756

Price is good until 5/23/13.

20-5.02C(1) Flow Sensor Cable

Flow sensor cable must be rated 600 V and 194°F, be UL listed as Type TC, meet requirements of ICEA/NEMA, and comply with the following:

1. The cable consists of two No. 16, minimum, stranded copper conductors. Each conductor must be insulated with either: 1) 18.9 mil, minimum nominal thickness, polypropylene or polyethylene material, 2) 15 mil, minimum nominal thickness, copolymer material, with a 4 mil, minimum nominal thickness, nylon jacket, or 3) 15 mil, minimum nominal thickness, polyvinyl chloride material, with a 5 mil, minimum nominal thickness, nylon jacket.
2. Color coding must distinguish each insulated conductor.
3. The shield must be either tinned copper braid or aluminized polyester film with a nominal 20 percent overlap. Where the film is used, a No. 18 (or larger, stranded) or a No. 16 (solid), tinned, copper drain wire must be placed between the insulated conductors and the shield and in contact with the conductive surface of the shield.
4. The jacket must be black polyvinyl chloride with minimum ratings of 600 V and 194°F and a minimum nominal thickness of either 1) 50 mils or 2) 48 mils where capacitance of conductors to other conductors and the shield is 87 pf/ft or better. The cable jacket must be marked with the manufacturer's name or trademark, insulation type designation, number of conductors and conductor size, and voltage and temperature ratings.
5. The finished, nominal outside diameter of the cable must not be less than 0.29 inches and not exceed 0.35 inches.
6. The cable must be sunlight resistant and suitable for direct burial.
7. The cable must be continuous, without splices, between components except where splices are shown.

20-5.02C(2) Flow Sensor Conduit

Conduit must be Type 3 rigid nonmetallic PVC conduit. Comply with section 86-2.05A

20-5.02D Concrete

Concrete must comply with section 20-3.02D.

20-5.03 CONSTRUCTION

20-5.03A General

Finish exposed top surfaces of concrete foundations and pads with a medium broom finish applied parallel to the long dimension of foundations and pads.

20-5.04 PAYMENT

Payment for irrigation controller enclosure cabinet, concrete foundation and pad and conduit sweeps are included in payment for the various types of irrigation controllers.

Payment for flow sensor cable and conduit is included in payment for flow sensor.

Replace "Reserved" in section 20-6 with:

20-6.01 GENERAL

20-6.01A Summary

Section 20-6 includes specifications for performing remote irrigation control system functional testing.

20-6.01B Definitions

CCU: Cluster control unit

RICS: Remote irrigation control system

20-6.01C Submittals

Submit a report containing the flow rate for each remote control valve after Stage 2 RICS testing.

20-6.01C(1) Notification

Notify the Engineer at least 15 business days prior to stage 1 and stage 2 RICS testing.

20-6.02 MATERIALS

Not used.

20-6.03 CONSTRUCTION

20-6.03A General

Functional tests are required for each irrigation controller and associated automatic irrigation system components served by a single electric service point, or a group of irrigation controllers and associated automatic irrigation system components served by a single electric service point.

The Engineer determines the length of the cycle.

The existing RICS base station is located in the District 11, Water Manager's office, located at 4050 Taylor Street, San Diego, CA, 92110, telephone No. (619) 894-0364.

The Department maintains and repairs existing base station facilities and will repair the following within 10 days of a malfunction:

1. Computer
2. Printer
3. Mouse
4. Keyboard
5. Cables
6. Software

20-6.03B RICS Testing

Unsatisfactory performance of tested irrigation systems components must be repaired and rechecked through one complete cycle of operation until satisfactory performance is obtained. Repairs will be at your expense, except for repairs to the existing base station.

RICS functional testing consists of two stages.

20-6.03B(1) Stage 1 RICS Testing

Stage one functional testing must:

1. Be performed without connection to the base station
2. Be satisfactorily completed before planting plants

3. Demonstrate to the Engineer, through one complete cycle of operation in the automatic mode, that the associated automatic components of the irrigation system operate properly.

20-6.03B(2) Stage 2 RICS Testing

Stage two functional testing must:

1. Be performed while connected to the existing RICS base station
2. Be satisfactorily completed after Stage 1 and before the start of the plant establishment period
3. Demonstrate to the Engineer, over a period of not less than 7 days of consecutive automatic operation, that the irrigation controllers and associated automatic irrigation components operate properly when connected to the base station
4. Test all facilities from Stage 1 and the following:
 - 4.1 Software programs
 - 4.2 Telephone service
 - 4.3 Radios for communication between the CCU and the irrigation controllers
5. Test the existing RICS base station to detect and report the following:
 - 5.1 Supply line (main) pipe and remote control valve master flow alarms

20-6.04 PAYMENT

Payment for RICS functional testing is included in payment for the various types of irrigation controllers.

Add to the first paragraph of section 20-7.01B(2):

4. Native sod
5. Potting soil

Add to section 20-7.02C(5):

Turf sod must be a mixture of tall fescue varieties and be healthy field grown sod containing not more than 1/2-inch-thick thatch. The age of turf sod must not be less than 8 months or more than 16 months.

Add to section 20-7.02C:

20-7.02C(6) Native Sod

Native sod must:

1. Comply with section 20-7.02C(5).
2. Be healthy field grown sod containing not more than 1/2 inch thick thatch.
3. Be not less than 8 months or more than 16 months in age.
4. Be grown on a biodegradable net or mesh.

Replace section 20-7.02D(7) with:

20-7.02D(7) Root Barrier

Root barrier must be an injection molded or extruded modular component made of high-density polypropylene or polyethylene plastic.

Panel must have a minimum thickness of 1/16 inch. Each panel must have a minimum of 4 molded vertical ribs and a locking strip or integral male/female sliding lock. Panel must be a minimum of 2 feet wide and 2 feet in depth.

Joining mechanism for panels must be designed to resist slippage between panels.

Vertical root-deflecting ribs or channels must be from 0.5 to 0.8 inch high, perpendicular to the panel and from 6 to 8 inches apart.

Add to section 20-7.02D(9):

Soil amendment must be nitrolized redwood or nitrolized cedar shavings.

Add to section 20-7.02D:

20-7.02D(12) Potting Soil

Potting soil must be an organic, peat-free, compost based potting soil, containing live micro-organisms (mycorrhizae). Potting soil must be composed of approximately 70% fine bark, 20% compost and 10% pumice, with organic fertilizer. Potting soil must be a commercially available product labeled as "Potting Soil."

Add to section 20-7.03B(2):

Weeds must be killed within all planting and erosion control (bonded fiber matrix) areas, including median areas, new and existing pavement, curbs, sidewalks, and other surfaced areas.

Replace the 1st paragraph in section 20-7.03B(2) with:

Dispose of weeds killed during the initial roadside clearing.

Replace the 2nd paragraph in section 20-7.03B(3) with:

Dispose of mowed material and weeds killed during the after initial roadside clearing.

Add to section 20-7.03C:

Plants adjacent to drainage ditches must be located so that after construction of the basins, no portion of the basin wall is less than the minimum distance shown for each plant involved.

Add to section 20-7.03F:

Do not perform planting work in cultivated areas for a period of 21 days after:

1. Cultivation is complete
2. Irrigation systems have been installed
3. Plant holes have been excavated and backfilled

For cultivated areas, keep the soil sufficiently moist to germinate weeds. Weeds that germinate must be killed.

Replace "Reserved" in section 20-7.03G with:

Weed germination must be performed in all irrigated planting and erosion control (bonded fiber matrix) areas.

Do not perform planting work in weed germination areas for a period of 21 days after:

1. Irrigation systems have been installed
2. Plant holes have been excavated and backfilled

For weed germination areas, keep the soil sufficiently moist to germinate weeds. Weeds that germinate must be killed.

Add to section 20-7.03I(11):

For plants planted within areas watered by an overhead irrigation system, the watering of these plants must occur between the hours of 10:00 PM and 6:00 AM within a maximum of 20 days after the plants have been planted.

Replace "Reserved" in section 20-7.03I(12) with:

Root barriers must be installed between trees and concrete sidewalk or curb as shown. Panels must be installed flush with the finished grade and joined with locking strips or integral male/female sliding locks. Barriers must be installed with root deflectors facing inward.

Add to section 20-7.03I(14):

When the turf sod has reached a height of 3 inches the turf must be mowed to a height of 2 inches. The turf sod edges adjacent to edging, sidewalks, and other paved borders and surfaced areas, must be trimmed to a uniform edge not extending over those items. Trimming must be repeated whenever the edge of turf extends 1 inch beyond the edge of the edging, sidewalks, and other paved borders and surfaced areas. Mowed and trimmed growth must be removed.

Add to section 20-7.03I:

20-7.03I(17) Native Sod

Comply with section 20-7.03I(14).

Outer edges of exposed sod must be covered with soil so that sod roots are not exposed.

Native sod areas will not be required to be mowed or trimmed.

Add to section 20-7.04:

Payment for prepare hole is included in payment for the various plant groups.

Add to section 20-9.01A:

The plant establishment period must be Type 2.

Replace section 20-9.01C(1) with:

20-9.01C(1) General

Submit the following seasonal watering schedules, March through May, June through August, September through October, and November through February, for use during the plant establishment period. The seasonal schedules must be submitted within 5 days of the beginning of each seasonal period. The seasonal watering schedules must be entered into the controllers by the Contractor.

Submit updated watering schedules within 5 business days after any changes have been made to the authorized schedules.

Submit revised watering schedules for each irrigation controller not less than 30 days before completion of the plant establishment period.

Add to section 20-9.03C:

Apply slow-release or controlled-release fertilizer to the plants during the 1st week of April, July and September of each year.

Add to section 20-9.03D:

Control weeds by:

1. Hand pulling:
 - 1.1. In plant basins and on basin walls
 - 1.2. In ground cover planting areas without plant basins
2. Killing:
 - 2.1. In mulched areas
 - 2.2. In planting areas without ground cover plantings or located outside of ground cover areas
 - 2.3. Within medians, pavement, curbs, sidewalks, and other surfaced areas
 - 2.4. Within erosion control (bonded fiber matrix) areas

Replace section 20-9.03I with:

20-9.03I Watering

Operate the RICS irrigation controllers in the "stand-alone" mode, except for the last 30 days of the plant establishment period. During the last 30 days of the plant establishment period water plants utilizing the RICS software program unless authorized. Submit a watering schedule appropriate for the season to the Engineer in writing for use during the 30 day period. The watering schedule will be entered into the controllers by the Engineer.

Operate the electric automatic irrigation systems irrigation controllers in the automatic mode unless authorized.

If any component of the electric automatic irrigation system is operated manually, the day will not be credited as a plant establishment working day unless the manual operation is authorized.

All overhead irrigation must be watered between the hours of 10:00 PM and 6:00 AM.

Add to section 20-9.03J:

When the turf sod has reached a height of 3 inches the turf must be mowed to a height of 2 inches. The turf sod edges adjacent to edging, sidewalks, and other paved borders and surfaced areas, must be trimmed to a uniform edge not extending over those items. Trimming must be repeated whenever the edge of turf extends 1 inch beyond the edge of the edging, sidewalks, and other paved borders and surfaced areas. Mowed and trimmed growth must be removed.

Replace the paragraphs in section 20-10.01C(1) with:

Test plots are not required.

Replace the paragraph in section 20-10.02B with:

Soil sterilant is not required.

Replace the paragraph in section 20-10.02C with:

Edging is not required.

Replace the paragraph in section 20-10.02D with:

Aggregate base is not required.

Replace the paragraph in section 20-10.02E with:

Filter fabric is not required.

Replace "Reserved" in section 20-10.02G with:

Decomposed granite must be crushed granite rock screenings graded from 3/8 inch particles to dust and comply with the following grading requirements:

Grading Requirements

Sieve size	Percent passing
3/8 inch	100
No. 4	95-100
No. 8	75-80
No. 16	55-65
No. 30	40-50
No. 50	25-35
No. 100	20-25
No. 200	5-15

Note:

Grading based upon AASHTO T11-82 and T27-82

The decomposed granite must be gray and come from the same source. The color must be uniform.

Replace the paragraph in section 20-10.02H with:

Solidifying emulsion is not required.

Replace "Reserved" in section 20-10.03A with:

Before performing decomposed granite work, clear areas to receive the decomposed granite under section 20-7.03B.

Replace the paragraphs in section 20-10.03B with:

Excavation is not required.

After clearing, grade areas to receive decomposed granite to a smooth, uniform surface, and compact to not less than 90 percent relative compaction. Place decomposed granite on compacted original ground.

Add to section 20-10.03G:

After satisfactory completion of the decomposed granite work, apply a topcoat of solidifying emulsion annually to the surface per the manufacturer's instructions. Continue the annual application until the plant establishment period is completed or until Contract acceptance.

Replace the paragraph in section 20-12.02B with:

Soil sterilant is not required.

Replace "Reserved" in section 20-12.02D with:

Rock must be clean, smooth, and obtained from a single source and must comply with the following grading requirements:

Grading Requirements

Screen size (inches)	Percentage passing
8	100
6	50-85
4	0-50

Replace "Reserved" in section 20-12.03A with:

Before performing rock blanket work, clear areas to receive the rock blanket under section 20-7.03B.

Replace the paragraphs in section 20-12.03B with:

Excavation is not required.

After clearing, grade areas to receive rock blanket to a smooth, uniform surface, and compact to not less than 90 percent relative compaction. Place rock blanket on compacted original ground.

Replace "Reserved" section 20-15 with:

20-15.01 GENERAL

20-15.01A Summary

Section 20-15 includes specifications for site furnishings.

20-15.01B Submittals

20-15.01B(1) Product Data

Submit the manufacturer's descriptive and technical literature for all materials.

20-15.01B(2) Certificate of Compliance

Submit a Certificate of compliance for site furnishings at least 5 business days before delivery of the materials to the job site.

20-15.02 MATERIALS

20-15.02A Tree Grates and Frames

Tree grates must be:

Manufacturer: Urban Accessories

Model: OT-T24 (5 foot square)

Finish/Material: Raw/Iron

Model: OT-T24 (4 by 6 feet)

Finish/Material: Raw/Iron

Tree grate frames must be:

Manufacturer: Urban Accessories

Model: "S" (5 foot square)

Finish/Material: Raw/Steel

Model: "S" (4 by 6 feet)

Finish/Material: Raw/Iron

The quoted prices for the tree grates and frames are as follows (excluding tax and freight):

Tree Grates (5 by 5 foot size): \$1,050.00 each

Tree Grates (4 by 6 foot size): \$1,050.00 each

Tree Grate Frames (5 by 5 foot size): \$203.00 each

Tree Grate Frames (4 by 6 foot size): \$174.00 each

You may obtain the tree grates and frames from:

Recreation Republic, Inc.
7668 El Camino Real, Suite 104-287
Carlsbad, CA 92009
(760) 690-4030

Prices are good until 12/28/2012.

20-15.02B Steel Bench

Benches must be:

Manufacturer: Landscape Forms
Model: Presidio Bench
Style: Backed Seats
Straight/Radius: Straight
Number of Seats: 3 Seat Unit
Mounting: Embedded
Arm option: All Arms (1 arm per space)
Powdercoat Color: Stone

The quoted price for the benches is \$2,250.40 each (excluding tax and freight).

You may obtain the steel benches from:

Landscape Forms
431 Lawndale Avenue
Kalamazoo, MI 49048-9543
(800) 441-1945 extension 1299

Prices are good until 01/04/2013.

20-15.02C Precast Concrete Planter

Precast concrete planter must be:

Manufacturer: Dura Art Stone
Description: Round Planter
Material: Concrete
Design: S-6-D-42
Color: S-7
Finish: Light Sandblast (LSB)
Drain Hole: 2 inch diameter

Each precast concrete planter includes four leveling pads: 4" by 4" by 3/8" with 1/2" bonded neoprene pad and 5/8" threaded rod welded to plate.

The quoted price for the precast concrete planters is \$2,238.00 each (excluding tax and freight).

You may obtain the precast concrete planters from:

Dura Art Stone
1785 Locust Street #7
Pasadena, CA 91106
(626) 577-6000

Prices are good until 12/31/2012.

20-15.03 CONSTRUCTION

Not used.

20-15.04 PAYMENT

Not used.

**Add to section 20:
20-16 ROCK MULCH**

20-16.01 GENERAL

20-16.01A Summary

Section 20-16 includes specifications for placing rock mulch.

Rock mulch of the types listed below is required at various locations as shown:

1. Rock Mulch (Type1)
2. Rock Mulch (Type 2)
3. Rock Mulch (Type 3)

20-16.01B Submittals

Submit the following:

1. Product data including the manufacturer's product sheet and the instructions for installing the filter fabric
2. Certificate of compliance for the filter fabric at least 5 business days before delivery of the material to the job site
3. A ten pound sample of each type of rock mulch (minimum 4 rocks)

20-16.02 MATERIALS

20-16.02A General

Rock mulch must be clean and free from vegetable matter and other deleterious substances. Rock for each rock mulch type must be obtained from a single source.

20-16.02B Filter Fabric

Filter fabric must be Class A.

20-16.02C Fasteners

Staples for filter fabric must comply with section 21-1.02R.

20-16.02D Rock Mulch

Rock for rock mulch (Type 1) must vary in size between 3 inches and 8 inches. The color of the rock must be mostly tan, and include a variety of colors including red, brown, gray, light gray and tan. Sprinkle 1/2" to 1-1/2" size rounded pebbles matching the color of the larger size rock over the surface of the rock mulch at a rate of 2 cubic feet per 100 square feet of rock mulch area.

Rock for rock mulch (Type 2) must be vary in size between 1/2 inch and 1 inch. The color of the rock must be gold.

Rock for rock mulch (Type 3) must be vary in size between 1/2 inch and 1 inch. The color of the rock must be gray.

20-16.03 CONSTRUCTION

20-16.03A General

Before performing rock mulch work, clear areas to receive the rock mulch under section 20-7.03B.

20-16.03B Earthwork

Earthwork must comply with section 19.

Excavate areas to receive rock mulch to the depth shown after clearing. Where rock mulch is to be placed adjacent to existing curbs, dikes, pavement, sidewalks or sound walls, excavate so that the finished rock mulch elevation adjacent to those items will maintain the planned flow lines, slope gradients, and contours of the job site. After excavation, grade subgrade to receive rock mulch to a smooth, uniform surface, and compact to not less than 90 percent relative compaction.

Antistrip Treatment Laboratory Procedures for Mix Design

Antistrip treatment	Laboratory procedure
Plasticity index from 4 to 10 ^a	
Dry hydrated lime with marination	LP-6
Lime slurry with marination	LP-7
Plasticity index less than 4	
Liquid	LP-5
Dry hydrated lime without marination	LP-6
Dry hydrated lime with marination	LP-6
Lime slurry with marination	LP-7

^a If the plasticity index is greater than 10, do not use that aggregate blend.

For the mix design of HMA Type A produced under the QC/QA construction process, determine the tensile strength ratio under California Test 371 on untreated HMA. If the tensile strength ratio is less than 70:

1. Choose from the antistrip treatments specified based on the plasticity index
2. Test treated HMA under California Test 371
3. Treat to a minimum tensile strength ratio of 70

Replace section 39-1.18 with:

39-1.18 HOT MIX ASPHALT AGGREGATE LIME TREATMENT—DRY LIME METHOD

39-1.18A General

39-1.18A(1) Summary

Treat HMA aggregate with lime using the dry lime method either with marination or without.

Treat aggregate for HMA Type A with dry lime.

39-1.18A(2) Submittals

Determine the exact lime proportions for fine and coarse virgin aggregate and submit them as part of the proposed JMF.

If marination is required, submit the averaged aggregate quality test results within 24 hours of sampling.

Submit a treatment data log from the dry lime and aggregate proportioning device in the following order:

1. Treatment date
2. Time of day the data is captured
3. Aggregate size being treated
4. HMA type and mix aggregate size
5. Wet aggregate flow rate collected directly from the aggregate weigh belt
6. Aggregate moisture content, expressed as a percent of the dry aggregate weight
7. Flow rate of dry aggregate calculated from the flow rate of wet aggregate
8. Dry lime flow rate
9. Lime ratio from the accepted JMF for each aggregate size being treated
10. Lime ratio from the accepted JMF for the combined aggregate
11. Actual lime ratio calculated from the aggregate weigh belt output, the aggregate moisture input, and the dry lime meter output, expressed as a percent of the dry aggregate weight
12. Calculated difference between the authorized lime ratio and the actual lime ratio

Each day during lime treatment, submit the treatment data log on electronic media in tab delimited format on a removable CD-ROM storage disk. Each continuous treatment data set must be a separate record using a line feed carriage return to present the specified data on 1 line. The reported data must include data titles at least once per report.

39-1.18A(3) Quality Control and Assurance

If marination is required, the QC plan must include aggregate quality control sampling and testing during lime treatment. Sample and test in compliance with minimum frequencies shown in the following table:

Aggregate Quality Control During Lime Treatment

Quality characteristic	Test method	Minimum sampling and testing frequency
Sand equivalent	California Test 217	Once per 1,000 tons of aggregate treated with lime
Percent of crushed particles	California Test 205	As necessary and as designated in the QC plan
Los Angeles Rattler	California Test 211	
Fine aggregate angularity	California Test 234	
Flat and elongated particles	California Test 235	

Note: During lime treatment, sample coarse and fine aggregate from individual stockpiles. Combine aggregate in the JMF proportions. Run tests for aggregate quality in triplicate and report test results as the average of 3 tests.

For any of the following, the Engineer orders proportioning operations stopped if you:

1. Do not submit the treatment data log
2. Do not submit the aggregate quality control data for marinated aggregate
3. Submit incomplete, untimely, or incorrectly formatted data
4. Do not take corrective actions
5. Take late or unsuccessful corrective actions
6. Do not stop treatment when proportioning tolerances are exceeded
7. Use malfunctioning or failed proportioning devices

If you stop treatment, notify the Engineer of any corrective actions taken and conduct a successful 20-minute test run before resuming treatment.

39-1.18B Materials

High-calcium hydrated lime and water must comply with section 24-2.02.

Before virgin aggregate is treated, it must comply with the aggregate quality specifications. Do not test treated aggregate for quality control except for gradation. The Department does not test treated aggregate for acceptance except for gradation.

The Engineer determines the combined aggregate gradation during HMA production after you have treated the aggregate.

Treated aggregate must not have lime balls or clods.

39-1.18C Construction

39-1.18C(1) General

Notify the Engineer at least 24 hours before the start of aggregate treatment.

Do not treat RAP.

Marinate aggregate if the plasticity index determined under California Test 204 is from 4 to 10.

If marination is required:

1. Treat and marinate coarse and fine aggregates separately.
2. Treat the aggregate and stockpile for marination only once.

3. Treat the aggregate separate from HMA production.

The lime ratio is the pounds of dry hydrated lime per 100 lb of dry virgin aggregate expressed as a percentage. Water content of slurry or untreated aggregate must not affect the lime ratio.

Aggregate gradations must have the lime ratio ranges shown in the following table:

Aggregate gradation	Lime ratio percent
Coarse	0.4–1.0
Fine	1.5–2.0
Combined	0.8–1.5

The lime ratio for fine and coarse aggregate must be within ± 0.2 percent of the lime ratio in the accepted JMF. The lime ratio must be within ± 0.2 percent of the authorized lime ratio when you combine the individual aggregate sizes in the JMF proportions.

Proportion dry lime by weight with a continuous operation.

The device controlling dry lime and aggregate proportioning must produce a treatment data log. The log consists of a series of data sets captured at 10-minute intervals throughout daily treatment. The data must be a treatment activity register and not a summation. The material represented by a data set is the quantity produced 5 minutes before and 5 minutes after the capture time. For the duration of the Contract, collected data must be stored by the controller.

If 3 consecutive sets of recorded treatment data indicate deviation more than 0.2 percent above or below the lime ratio in the accepted JMF, stop treatment.

If a set of recorded treatment data indicates a deviation of more than 0.4 percent above or below the lime ratio in the accepted JMF, stop treatment and do not use the material represented by that set of data in HMA.

If 20 percent or more of the total daily treatment indicates deviation of more than 0.2 percent above or below the lime ratio in the accepted JMF, stop treatment and do not use the day's treated aggregate in HMA.

If you stop treatment for noncompliance, you must implement corrective action and successfully treat aggregate for a 20-minute period. Notify the Engineer before beginning the 20-minute treatment period.

If you use a batch-type proportioning operation for HMA production, control proportioning in compliance with the specifications for continuous mixing plants. Use a separate dry lime aggregate treatment operation from HMA batching operations including:

1. Pugmill mixer
2. Controller
3. Weigh belt for the lime
4. Weigh belt for the aggregate

If using a continuous mixing operation for HMA without lime marinated aggregates, use a controller that measures the blended aggregate weight after any additional water is added to the mixture. The controller must determine the quantity of lime added to the aggregate from the aggregate weigh belt input in connection with the manually input total aggregate moisture, the manually input target lime content, and the lime proportioning system output. Use a continuous aggregate weigh belt and pugmill mixer for the lime treatment operation in addition to the weigh belt for the aggregate proportioning to asphalt binder in the HMA plant. If you use a water meter for moisture control for lime treatment, the meter must comply with California Test 109.

At the time of mixing dry lime with aggregate, the aggregate moisture content must ensure complete lime coating. The aggregate moisture content must not cause aggregate to be lost between the point of weighing the combined aggregate continuous stream and the dryer. Add water for mixing and coating

aggregate to the aggregate before dry lime addition. Immediately before mixing lime with aggregate, water must not visibly separate from aggregate.

The HMA plant must be equipped with a bag-house dust system. Material collected in the dust system must be returned to the mix.

39-1.18C(2) Mixing Dry Lime and Aggregate

Mix aggregate, water, and dry lime with a continuous pugmill mixer with twin shafts. Immediately before mixing lime with aggregate, water must not visibly separate from the aggregate. Store dry lime in a uniform and free-flowing condition. Introduce dry lime to the pugmill in a continuous operation. The introduction must occur after the aggregate cold feed and before the point of proportioning across a weigh belt and the aggregate dryer. Prevent loss of dry lime.

If marination is required, marinate treated aggregate in stockpiles from 24 hours to 60 days before using in HMA. Do not use aggregate marinated more than 60 days.

The pugmill must be equipped with paddles arranged to provide sufficient mixing action and mixture movement. The pugmill must produce a homogeneous mixture of uniformly coated aggregates at mixer discharge.

If the aggregate treatment operation is stopped longer than 1 hour, clean the equipment of partially treated aggregate and lime.

Aggregate must be completely treated before introduction into the mixing drum.

39-1.18D Payment

Payment for dry lime treating the aggregate, including marination, is included in payment for the HMA involved.

Replace section 39-1.19 with:

39-1.19 HOT MIX ASPHALT AGGREGATE LIME TREATMENT—SLURRY METHOD

39-1.19A General

39-1.19A(1) Summary

Treat HMA aggregate with lime using the slurry method and place it in stockpiles to marinate.

Treat aggregate for HMA Type A with lime slurry.

39-1.19A(2) Submittals

Determine the exact lime proportions for fine and coarse virgin aggregate and submit them as part of the proposed JMF.

Submit the averaged aggregate quality test results to the Engineer within 24 hours of sampling.

Submit a treatment data log from the slurry proportioning device in the following order:

1. Treatment date
2. Time of day the data is captured
3. Aggregate size being treated
4. Wet aggregate flow rate collected directly from the aggregate weigh belt
5. Moisture content of the aggregate just before treatment, expressed as a percent of the dry aggregate weight
6. Dry aggregate flow rate calculated from the wet aggregate flow rate
7. Lime slurry flow rate measured by the slurry meter
8. Dry lime flow rate calculated from the slurry meter output
9. Authorized lime ratio for each aggregate size being treated
10. Actual lime ratio calculated from the aggregate weigh belt and the slurry meter output, expressed as a percent of the dry aggregate weight
11. Calculated difference between the authorized lime ratio and the actual lime ratio
12. Dry lime and water proportions at the slurry treatment time

Every day during lime treatment, submit the treatment data log on electronic media in tab delimited format on a removable CD-ROM storage disk. Each continuous treatment data set must be a separate record using a line feed carriage return to present the specified data on 1 line. The reported data must include data titles at least once per report.

39-1.19A(3) Quality Control and Assurance

The QC plan must include aggregate quality control sampling and testing during aggregate lime treatment. Sample and test in compliance with frequencies in the following table:

Aggregate Quality Control During Lime Treatment

Quality characteristic	Test method	Minimum sampling and testing frequency
Sand equivalent	California Test 217	Once per 1,000 tons of aggregate treated with lime
Percent of crushed particles	California Test 205	As necessary and as designated in the QC plan
Los Angeles Rattler	California Test 211	
Fine aggregate angularity	California Test 234	
Flat and elongated particles	California Test 235	

Note: During lime treatment, sample coarse and fine aggregate from individual stockpiles. Combine aggregate in the JMF proportions. Run tests for aggregate quality in triplicate and report test results as the average of 3 tests.

For any of the following, the Engineer orders proportioning operations stopped if you:

1. Do not submit the treatment data log
2. Do not submit the aggregate quality control data
3. Submit incomplete, untimely, or incorrectly formatted data
4. Do not take corrective actions
5. Take late or unsuccessful corrective actions
6. Do not stop treatment when proportioning tolerances are exceeded
7. Use malfunctioning or failed proportioning devices

If you stop treatment, notify the Engineer of any corrective actions taken and conduct a successful 20-minute test run before resuming treatment.

For the aggregate to be treated, determine the moisture content at least once during each 2 hours of treatment. Calculate moisture content under California Test 226 or 370 and report it as a percent of dry aggregate weight. Use the moisture content calculations as a set point for the proportioning process controller.

39-1.19B Materials

High-calcium hydrated lime and water must comply with section 24-2.02.

Before virgin aggregate is treated, it must comply with the aggregate quality specifications. Do not test treated aggregate for quality control except for gradation. The Engineer does not test treated aggregate for acceptance except for gradation.

The Engineer determines the combined aggregate gradation during HMA production after you have treated the aggregate. If RAP is used, the Engineer determines combined aggregate gradations containing RAP under Laboratory Procedure LP-9.

Treated aggregate must not have lime balls or clods.

39-1.19C Construction

39-1.19C(1) General

Notify the Engineer at least 24 hours before the start of aggregate treatment.

Treat aggregate separate from HMA production.

Do not treat RAP.

Add lime to the aggregate as slurry consisting of mixed dry lime and water at a ratio of 1 part lime to from 2 to 3 parts water by weight. The slurry must completely coat the aggregate.

Lime treat and marinate coarse and fine aggregates separately.

Immediately before mixing lime slurry with the aggregate, water must not visibly separate from the aggregate.

Treat the aggregate and stockpile for marination only once.

The lime ratio is the pounds of dry hydrated lime per 100 lb of dry virgin aggregate expressed as a percentage. Water content of slurry or untreated aggregate must not affect the lime ratio.

The following aggregate gradations must have the lime ratio ranges shown in the following table:

Aggregate gradation	Lime ratio percent
Coarse	0.4–1.0
Fine	1.5–2.0
Combined virgin aggregate	0.8–1.5

The lime ratio for fine and coarse aggregate must be within ± 0.2 percent of the lime ratio in the accepted JMF. The lime ratio must be within ± 0.2 percent of the authorized lime ratio when you combine the individual aggregate sizes in the JMF proportions. The lime ratio must be determined before the addition of RAP.

If 3 consecutive sets of recorded treatment data indicate deviation more than 0.2 percent above or below the lime ratio in the accepted JMF, stop treatment.

If a set of recorded treatment data indicates a deviation of more than 0.4 percent above or below the lime ratio in the accepted JMF, stop treatment and do not use the material represented by that set of data in HMA.

If 20 percent or more of the total daily treatment indicates deviation of more than 0.2 percent above or below the lime ratio in the accepted JMF, stop treatment and do not use the day's total treatment in HMA.

If you stop treatment for noncompliance, you must implement corrective action and successfully treat aggregate for a 20-minute period. Notify the Engineer before beginning the 20-minute treatment period.

39-1.19C(2) Lime Slurry Proportioning

Proportion lime and water with a continuous or batch operation.

The device controlling slurry proportioning must produce a treatment data log. The log consists of a series of data sets captured at 10-minute intervals throughout daily treatment. The data must be a treatment activity register and not a summation. The material represented by the data set is the quantity produced 5 minutes before and 5 minutes after the capture time. For the Contract's duration, collected data must be stored by the controller.

39-1.19C(3) Proportioning and Mixing Lime Slurry Treated Aggregate

Treat HMA aggregate by proportioning lime slurry and aggregate by weight in a continuous operation.

Marinate treated aggregate in stockpiles from 24 hours to 60 days before using in HMA. Do not use aggregate marinated longer than 60 days.

39-1.19D Payment

Payment for treating aggregates with lime slurry is included in payment for the HMA involved.

Replace section 39-1.20 with:

39-1.20 LIQUID ANTISTRIP TREATMENT

39-1.20A General

39-1.20A(1) Summary

Treat asphalt binder with liquid antistrip (LAS) treatment to bond the asphalt binder to aggregate in HMA.

39-1.20A(2) Submittals

For LAS, submit with the proposed JMF submittal:

1. MSDS
2. One 1-pint sample
3. Infrared analysis including copy of absorption spectra

Submit a certified copy of test results and an MSDS for each LAS lot.

Submit a certificate of compliance for each LAS shipment. With each certificate of compliance, submit:

1. Your signature and printed name
2. Shipment number
3. Material type
4. Material specific gravity
5. Refinery
6. Consignee
7. Destination
8. Quantity
9. Contact or purchase order number
10. Shipment date

Submit proportions for LAS as part of the JMF submittal. If you change the brand or type of LAS, submit a new JMF.

For each job site delivery of LAS, submit one 1/2-pint sample to METS. Submit shipping documents to the Engineer. Label each LAS sampling container with:

1. LAS type
2. Application rate
3. Sample date
4. Contract number

At the end of each day's production shift, submit production data in electronic and printed media. Present data on electronic media in tab delimited format. Use line feed carriage return with 1 separate record per line for each production data set. Allow sufficient fields for the specified data. Include data titles at least once per report. For each mixing operation type, submit in order:

1. Batch mixing:
 - 1.1. Production date
 - 1.2. Time of batch completion
 - 1.3. Mix size and type
 - 1.4. Each ingredient's weight
 - 1.5. Asphalt binder content as a percentage of the dry aggregate weight
 - 1.6. LAS content as a percentage of the asphalt binder weight
2. Continuous mixing:
 - 2.1. Production date
 - 2.2. Data capture time
 - 2.3. Mix size and type

- 2.4. Flow rate of wet aggregate collected directly from the aggregate weigh belt
- 2.5. Aggregate moisture content as percentage of the dry aggregate weight
- 2.6. Flow rate of asphalt binder collected from the asphalt binder meter
- 2.7. Flow rate of LAS collected from the LAS meter
- 2.8. Asphalt binder content as percentage of total weight of mix calculated from:
 - 2.8.1. Aggregate weigh belt output
 - 2.8.2. Aggregate moisture input
 - 2.8.3. Asphalt binder meter output
- 2.9. LAS content as percentage of the asphalt binder weight calculated from:
 - 2.9.1. Asphalt binder meter output
 - 2.9.2. LAS meter output

39-1.20A(3) Quality Control and Assurance

For continuous mixing and batch mixing operations, sample asphalt binder before adding LAS. For continuous mixing operations, sample combined asphalt binder and LAS after the static mixer.

The Engineer orders proportioning operations stopped for any of the following if you:

- 1. Do not submit data
- 2. Submit incomplete, untimely, or incorrectly formatted data
- 3. Do not take corrective actions
- 4. Take late or unsuccessful corrective actions
- 5. Do not stop production when proportioning tolerances are exceeded
- 6. Use malfunctioning or failed proportioning devices

If you stop production, notify the Engineer of any corrective actions taken before resuming.

39-1.20B Materials

LAS-treated asphalt binder must comply with the specifications for asphalt binder in section 39-1.02C. Do not use LAS as a substitute for asphalt binder.

LAS total amine value must be 325 minimum when tested under ASTM D 2074.

Use only 1 LAS type or brand at a time. Do not mix LAS types or brands.

Store and mix LAS under the manufacturer's instruction.

39-1.20C Construction

LAS must be from 0.5 to 1.0 percent by weight of asphalt binder.

If 3 consecutive sets of recorded production data show actual delivered LAS weight is more than ± 1 percent of the authorized mix design LAS weight, stop production and take corrective action.

If a set of recorded production data shows actual delivered LAS weight is more than ± 2 percent of the authorized mix design LAS weight, stop production. If the LAS weight exceeds 1.2 percent of the asphalt binder weight, do not use the HMA represented by that data.

The continuous mixing plant controller proportioning the HMA must produce a production data log. The log consists of a series of data sets captured at 10-minute intervals throughout daily production. The data must be a production activity register and not a summation. The material represented by the data is the quantity produced 5 minutes before and 5 minutes after the capture time. For the duration of the Contract, collected data must be stored by the plant controller or a computer's memory at the plant.

39-1.20D Payment

Payment for treating asphalt binder with LAS is included in payment for the HMA involved.

Longitudinal contraction joint must be Type A2. Transverse contraction joint must be Type A1.

Replace section 40-2 with:

40-2 JOINTED PLAIN CONCRETE PAVEMENT

40-2.01 GENERAL

40-2.01A Summary

Section 40-2 includes specifications for constructing JPCP.

40-2.01B Submittals

40-2.01B(1) General

Not Used

40-2.01B(2) Early Age Crack Mitigation System

At least 24 hours before each paving shift, submit the following information as an informational submittal:

1. Early age stress and strength predictions
2. Scheduled sawing and curing activities
3. Contingency plan if cracking occurs

40-2.01C Quality Control and Assurance

40-2.01C(1) General

Not Used

40-2.01C(2) Quality Control Plan

The QC plan must include a procedure for identifying transverse contraction joint locations relative to the dowel bars longitudinal center and a procedure for consolidating concrete around the dowel bars.

40-2.01C(3) Early Age Crack Mitigation System

For PCC concrete pavement, develop and implement a system for predicting stresses and strength during the initial 72 hours after paving. The system must include:

1. Subscription to a weather service to obtain forecasts for wind speed, ambient temperatures, humidity, and cloud cover
2. Portable weather station with an anemometer, temperature and humidity sensors, located at the paving site
3. Early age concrete pavement stress and strength prediction computer program
4. Analyzing, monitoring, updating, and reporting the system's predictions

40-2.02 MATERIALS

Not Used

40-2.03 CONSTRUCTION

40-2.03A General

Transverse contraction joints on a curve must be on a single straight line through the curve's radius point.

40-2.03B Tie Bar Placement

If the curvature of a concrete pavement slab prevents equal spacing of tie bars to maintain the minimum clearance from transverse joints, space them from 15 to 18 inches.

40-2.03C Ramp Termini

For ramp termini, use heavy brooming normal to the ramp centerline to produce a coefficient of friction of at least 0.35 determined on the hardened surface under California Test 342.

40-2.03D Removal and Replacement

When replacing concrete, saw cut and remove to full depth and width.

Saw cut full slabs at the longitudinal and transverse joints. Saw cut partial slabs at joints and where the Engineer orders. You may make additional saw cuts within the removal area to facilitate slab removal or to prevent binding of the saw cut at the removal area's edge. Saw cut perpendicular to the slab surface.

Use slab lifting equipment with lifting devices that attach to the slab. After lifting the slab, paint the cut ends of dowels and tie bars.

Construct transverse and longitudinal construction joints between the new slab and existing concrete using dowel bars. For longitudinal joints, offset dowel bar holes from original tie bars by 3 inches. For transverse joints, offset dowel bar holes from the original dowel bar by 3 inches.

Drill holes and use chemical adhesive to bond the dowel bars to the existing concrete. Use an automated dowel bar drilling machine. Holes must be at least 1/8-inch greater than the dowel bar diameter. Clean the holes in compliance with the chemical adhesive manufacturer's instructions. Holes must be dry when you place chemical adhesive.

Immediately after inserting dowel bars into the chemical adhesive-filled holes, support the dowel bars and leave them undisturbed for the minimum cure time recommended by the chemical adhesive manufacturer.

Clean the faces of joints and underlying base from loose material and contaminants. Coat the faces with a double application of pigmented curing compound under section 28-2.03F. For partial slab replacements, place preformed sponge rubber expansion joint filler at new transverse joints under ASTM D 1752.

40-2.04 PAYMENT

Not Used

Replace section 40-8 with: 40-8 PERVIOUS CONCRETE PAVEMENT

40-8.01 GENERAL

40-8.01A Summary

Section 40-8 includes specifications for constructing pervious concrete pavement.

Section 40-1 does not apply.

40-8.01B Definitions

Not Used

40-8.01C Submittals

Submit test data supporting your minimum cementitious material determination. Using trial batches is recommended.

Submit documentation of certifications of pervious concrete placement crew members.

Submit cores.

40-8.01D Quality Control and Assurance

40-8.01D(1) General

Not Used

40-8.01D(2) Test Panels

The Engineer uses authorized test panels as the standard when evaluating the texture and color of the pavement surface.

As a first order of work, construct test panels at the jobsite. Use the materials, tools, equipment, personnel, and methods you will use in the work. Construct at least 2 test panels. Each panel must be at least 225 sq ft. If joints are shown, construct the joints within each panel. Test panels must meet the requirements for surface finish, void content, thickness, and joints.

Take 3 core samples from each panel. The void content of each core must be within the specified range.

If the Engineer rejects the test panels, construct new test panels.

Obtain authorization of the test panels before placing other previous concrete pavement.

Remove and dispose of rejected test panels. Authorized test panels must remain in place until all pervious concrete pavement is completed. If authorized test panels are not constructed within the limits shown for pervious concrete pavement, remove and dispose of them.

40-8.01D(3) Prepaving Conference

Schedule a prepaving conference at a mutually agreed upon time and place to meet with the Engineer. Make the arrangements for the conference facility. Discuss methods of performing each item of the work.

Prepaving conference attendees must sign an attendance sheet provided by the Engineer. The prepaving conference must be attended by your:

1. Project superintendent
2. Pervious concrete construction foreman and your National Ready Mix Concrete Association (NRMCA) certified pervious concrete craftsman. If you do not employ a craftsman, your NRMCA certified pervious concrete installer must attend.
3. Earthwork construction foreman
4. Base construction foreman
5. Concrete quality control or technical services manager

Do not start paving work until the listed personnel have attended the prepaving conference.

40-8.01D(4) Personnel Qualifications

The paving crew must meet one of the following criteria:

1. Crew must employ 1 or more NRMCA certified pervious concrete craftsman who must be onsite actively working with and guiding the placement crew during pervious concrete placement.
2. Crew must employ 3 or more NRMCA certified pervious concrete installers who must be onsite actively working with and guiding the placement crew during pervious concrete placement.
3. Crew must employ 1 or more NRMCA certified pervious concrete installer and 3 or more NRMCA certified pervious concrete technicians who must all be onsite actively working with and guiding the placement crew during pervious concrete placement.

40-8.01D(5) Plastic Concrete Testing

For each day of paving, test pervious concrete for unit weight under ASTM C 1688 at least once for each 150 cu yd placed or fraction thereof. Unit weight must be within 5 lb/cu ft of the submitted mixture proportions.

40-8.01D(6) Cores

For each day of paving, core 3 samples for each 10,000 sq ft or fraction thereof. The Engineer determines coring locations.

40-8.01D(7) Void Content

The Department tests void content under section 90-7. The void content must be 22 percent or less.

40-8.01D(8) Infiltration Rate

Test the infiltration rate under ASTM C1701. Perform 3 tests in areas up to 25,000 sf. Conduct one test for each additional 10,000 sf. Separate each test locations by at least 20 ft. Do not perform tests (1) if there is standing water on the pavement surface or (2) less than 24 hours after 1/4 inch or more of rain. The infiltration rate must be at least 100 inches/hour.

40-8.02 MATERIALS

Comply with the specifications for pervious concrete in section 90-7.

The maximum size aggregate for the pavement surface must not exceed 1/2 inch. If the pavement is constructed in 2 or more layers, layers below the surface layer may have a larger maximum size aggregate.

Determine the minimum cementitious material content. The cementitious material content must not exceed 590 lbs/cu yd.

Joint filler for isolation joints must (1) be preformed expansion joint filler for concrete, bituminous type, and (2) comply with ASTM D 994.

40-8.03 CONSTRUCTION

40-8.03A General

Not Used

40-8.03B Subgrade Preparation

Immediately before placing pavement, grade and finish the subgrade. The subgrade must:

1. Comply with the specified compaction and grading
2. Be free of loose and extraneous material
3. Be uniformly moist and free of standing or flowing water

The finished subgrade surface must not project into the pavement cross-section at any point. Verify the finished subgrade surface by:

1. Means of a template supported on the side forms for fixed form method
2. Measuring from the offset guide line or survey marks for extruded or slip form methods

Fill areas of subgrade lower than the required grade with pervious concrete pavement. No payment is made for pavement used to fill these low areas.

40-8.03C Paving

Place pervious concrete pavement under section 40-1.03H(1) except the 3rd paragraph does not apply.

Spread, compact, and shape pervious concrete pavement under section 40-1.03H(4) or under section 40-1.03H(5). Vibrators must not be used. You may use wood side forms.

Compact pervious concrete to the required cross section. If you construct pervious concrete pavement in 2 or more layers, compact the lower layer before placing the next layer. Do not allow cold joints between layers. Compact within 30 minutes after spreading the pervious concrete. Do not disturb placed plastic concrete. Do not allow foot traffic on the un-compacted surface.

Use hand tampers to compact the concrete along the formed edges. After compaction and repair of surface flaws no further finishing is required.

If you delay placing 2 consecutive loads of pervious concrete by 20 minutes or more, form a construction joint. The joint must comply with section 40-1.03E(2) except you must remove the bulkhead and dampen the face with an atomized spray when placement continues.

40-8.03D Joints

Construct contraction joints by scoring concrete with a grooving tool and rounding corners with an edger tool or by saw-cutting hardened concrete to a depth of at least 1/4 of the pavement depth.

Construct an isolation joint at pre-existing structures that abut or penetrate the pervious concrete area. The isolation joint must extend the full depth of the pervious concrete. Place and secure the isolation joint material before placing concrete.

40-8.03E Finishing

The finished surface must not vary more than 0.02 foot from a 12 foot straightedge except at grade changes.

If placing pavement around or adjacent to miscellaneous structures such as manholes or pipe inlets, do not finish the miscellaneous structures to final grade until the pavement is finished beyond the miscellaneous structure.

40-8.04 PAYMENT

Pervious concrete pavement is measured based on the dimensions shown.

Payment for preparing the subgrade is not included in the payment for pervious concrete pavement.

Replace section 40-9 with:

40-9 PERMEABLE INTERLOCKING CONCRETE PAVEMENT

40-9.01 GENERAL

40-9.01A Summary

Section 40-9 includes specifications for furnishing and installing concrete pavers for permeable interlocking concrete pavement (PICP.)

Section 40-1 does not apply.

40-9.01B Definitions

bundle: several paver layers packaged together

paver layer: concrete pavers manufactured into patterned layers and ready for mechanical installation

mechanical installation: using a machine to lift and install paving layers

laying face: exposed, vertical face of a row of concrete pavers complete in place

40-9.01C Submittals

For jointing and bedding aggregates submit:

1. Gradation under California Test 202
2. Crushed particle under California Test 205
3. Abrasion loss under California Test 211
4. Cleanness value under California Test 227

For pavers submit:

1. Four manufactured, representative full-size samples of each type, thickness, finish, and color
2. Laboratory test reports indicating compliance with ASTM C 936

Submit PICP installation crew qualifications.

40-9.01D Quality Control and Assurance

40-9.01D(1) General

Not Used

40-9.01D(3) Prepaving Conference

Before starting earthwork, schedule a prepaving conference at a mutually agreed upon time and place to meet with the Engineer. Make the arrangements for the conference facility. Discuss methods of performing each step of the work.

Prepaving conference attendees must sign an attendance sheet provided by the Engineer. The prepaving conference must be attended by your:

1. Project superintendent
2. Paving construction foreman
3. Earthwork construction foreman
4. Base construction foreman
5. Foremen overseeing each installation crew
6. Paver manufacturer representative
7. Testing laboratory representative

Do not start PICP work until the listed personnel have attended the prepaving conference.

40-9.01D(2) Test Panels

The Engineer uses authorized test panels as the standard when evaluating the texture and color of the PICP surface.

As a first order of work, construct and test panels at the jobsite. Use the materials, tools, equipment, personnel, and methods you will use in the work. Construct at least 2 test panels. Test panels must meet the requirements for surface finish, thickness, and joints.

Test panels must be:

1. Constructed at an authorized location
2. At least 15 by 15 ft if the pavers are installed manually
3. At least 35 by 35 ft if the pavers are installed mechanically
4. Installed using the same personnel, materials, equipment, and methods to be used in the work

If the Engineer rejects the test panels, construct new test panels.

Obtain authorization of the test panels before placing other PICP.

Remove and dispose of rejected test panels. Authorized test panels must remain in place until all PICP is completed. If authorized test panels are not constructed within the limits shown for PICP, remove and dispose of them.

40-9.01D(3) Just-In-Time Training

Not Used

40-9.01D(4) Personnel Qualifications

Foremen overseeing each installation crew must hold a current PICP installer technician course certificate from the Interlocking Concrete Pavement Institute.

40-9.01D(5) Aggregate

At least once per project, test aggregate as shown in the following table:

Test	Test method
Sieve analysis	CT 202
Percent of crushed particles, course aggregate, 2 fractured faces, percent minimum	CT 205
Los Angeles Rattler, loss at 500 revolutions, percent maximum	CT 211
Cleanness value	CT 227

40-9.01D(6) Surface Infiltration Testing

Test the completed PICP surface under ASTM C1701. For each area of 25,000 sf, perform 3 tests. For each additional area of 10,000 sf or less, perform 1 test. Each test location must be separated by at least 20 ft. Do not perform tests (1) if there is standing water on the pavement surface or (2) less than 24 hours after 1/4 inch or more of rain. The infiltration rate must be at least 100 inches/hour.

40-9.02 MATERIALS

40-9.02A General

The aggregate for bedding and jointing must be graded within the limits shown in the following table:

Sieve size	Percentage passing		
	No. 8	No. 89	No. 9
1/2 inch	100	100	100
3/8 inch	85–100	90–100	100
No. 4	10–30	20–55	85–100
No. 8	0–10	5–30	10–40
No. 16	0–5	0–10	0–10
No. 50	--	0–5	0–5

If the joints between manufactured units are 1/4 inch wide or less, use no. 89 or no. 9 aggregate.

At least 95 percent of the aggregate particles must have at least 2 fractured faces.

The abrasion loss of the aggregate must not exceed 40 percent.

The cleanness value of the aggregate must be at least 80.

40-9.02B Pavers

Pavers must:

1. Comply with ASTM C 936
2. Be integrally colored, closely resembling Ackerstone's Aqua Via 2 permeable interlocking concrete paver, Catina Blend

Pavers must be at least 3-1/8 inch thick.

40-9.03 CONSTRUCTION

40-9.03A General

Not Used

40-9.03B Aggregate Base and Aggregate Bedding

Immediately before placing aggregate bedding, the aggregate base under it must be

1. Compacted and graded as specified
2. Free of loose and extraneous material
3. Free of standing or flowing water

Moisten, spread, and screed the aggregate bedding over the aggregate base. Test the screeded surface for smoothness with a 12-foot straightedge. The surface must be within 0.03 ft of the straightedge's lower edge.

Keep all vehicles off the screeded surface. If you disturb the aggregate base, recompact and regrade. If you disturb the screeded surface, screed the surface and retest for smoothness with the straightedge.

40-9.03C Pavers and Jointing Aggregate

Install pavers in the pattern shown. Maintain straight pattern lines.

Fill gaps at the edges of the PICP area with cut pavers. Cut pavers must be at least one-third of a whole paver. Use a masonry saw to cut the pavers.

Fill the joints with dry jointing aggregate by sweeping. Remove excess aggregate by sweeping.

Compact jointing aggregate and seat the pavers into the bedding course using a low-amplitude, 75-90 Hz plate compactor capable of at least 5,000 lbf. Make two passes across the PICP with the plate compactor. Do not compact within 6 ft of the unconfined edges of the PICP. Remove and replace any cracked pavers.

Apply additional jointing aggregate and fill within 1/4-inch of the top of the pavers. Remove excess aggregate by sweeping.

RW12R	RW Stem and Cap, Pilasters, Concrete Barrier Type 26 (Mod)
RW27R	RW Stem and Cap, Parapet
RW27L	RW Stem; Concrete Barrier; Pilasters; End Blocks
RW61L	RW Stem and Cap; Concrete Barrier Type 26 (mod), Pilasters, End Blocks
RW285L	RW Stem and Cap; Concrete Barrier Type 26 (mod), Type 60 (Mod)
RW296L	RW Stem and Cap; Concrete Barrier Type 26 (mod), Pilasters
RW296R	RW Stem
RW299L	RW Stem and Cap; Soundwall and Cap; Pilasters and Caps; Parapet
RW301L	RW Stem and Cap; Soundwall and Cap; Pilasters and Caps; Parapet
RW301R	RW Stem
RW311R	RW Stem and Cap; Soundwall and Cap; Pilasters and Caps; Parapet
RW316R	RW Stem and Cap; Soundwall and Cap; Pilasters and Caps; Parapet, End Wall

Add to section 51-1.01A:

For structural concrete headwall and junction structure:

1. Bar reinforcing steel must comply with section 52 except you may use deformed bars complying with ASTM A 615/A 615M, Grade 60.
2. Structure excavation and backfill must comply with section 19-3.

Add to section 51-1.02B:

Aggregate for all columns at all bents must be the 1-inch combined aggregate grading complying with section 90-1.02C(4)(d).

Replace the 1st paragraph in section 51-1.03F(5)(b)(i) with:

Except for bridge widenings, texture the bridge deck surfaces longitudinally by grinding and grooving.

Crosswalk architectural treatment (stain and sawcut) must be applied to the bridge deck of the Palomar Street OH (Bridge 57-1222) in the crosswalk area must comply with the following:

1. Architectural treatment (stain and score) must consist of acid stained concrete with sawcut joints.
2. Smooth banding must receive a light sand blast finish.
3. After finish textures are completed, sawcut construction joint lines to the depth and pattern as shown. Grooves must be from 1/8 inch deep and 3/16 inch wide after concrete has hardened.
4. After sawcut joints are completed, crosswalk architectural surface must be acid stained.
5. Complete a test panel under section 51-1.01(D)3 before starting the heavy sandblast texture and staining process. The test panel must have acid stain over architectural surfaces and sawcut joints. The test panel approved by the Engineer will be used as the standard of comparison in determining acceptability of Concrete Color (Stain) and Heavy Sandblast Texture.

6. The final color of the stained concrete must be gold, closely conforming to Lithochrome Chemstain Classic CS-15 "Antique Amber".
7. The color of the sealing compound must be clear with a low gloss finish.

Add between the 1st and 2nd paragraphs in section 51-7.01B:

Concrete for stem walls, seat walls, cube seats and monument sign must be colored. Color the concrete with an integral, fade resistant mineral oxide or synthetic type product. Color must be tan, closely resembling Davis Color No. 5447, "Mesa Buff."

Replace "Reserved" in section 51-7.02 with:

51-7.02A General

51-7.02A(1) Summary

Section 51-7.02 includes specifications for constructing PC drainage inlets.

51-7.02A(2) Definitions

Reserved

51-7.02A(3) Submittals

For inlets with oval or circular cross sections, submit shop drawings with calculations. Shop drawings and calculations must be sealed and signed by an engineer who is registered as a civil engineer in the State. Allow 15 days for the Engineer's review.

Submit field repair procedures and a patching material test sample before repairs are made. Allow 10 days for the Engineer's review.

51-7.02A(4) Quality Control and Assurance

The Engineer may reject PC drainage inlets exhibiting any of the following:

1. Cracks passing through walls more than 1/16 inch wide
2. Nonrepairable honeycombed or spalled areas of more than 6 square inches
3. Noncompliance with reinforcement tolerances or cross sectional area shown
4. Wall or lid less than minimum thickness
5. Internal dimensions less than plan dimensions by 1 percent or 1/2 inch, whichever is greater
6. Defects affecting performance or structural integrity

51-7.02B Materials

51-7.02B(1) General

Nonshrink grout must be a dry, packaged type complying with ASTM C 1107.

Concrete for basin or inlet floors placed in the field must comply with the specifications for minor concrete.

Joint sealant must be butyl-rubber complying with ASTM C 990. Joint primer must be recommended by the joint seal manufacturer.

Resilient connectors must comply with ASTM C 923.

Sand bedding must comply with section 19-3.02E.

Bonding agents must comply with ASTM C 1059, Type II.

51-7.02B(1) Fabrication

If oval or circular shape cross-sections are furnished, they must comply with *AASHTO LRFD Bridge Design Specifications, Fourth Edition with California Amendments*.

Wall and slab thicknesses may be less than the dimensions shown by at most 5 percent or 3/16 inch, whichever is greater.

Reinforcement placement must not vary more than 1/2 inch from the positions shown.

Add to section 73-4.01A:

Minor concrete of the types listed below is required at various locations as shown:

1. Minor Concrete (Type 1) (Exposed Aggregate)
2. Minor Concrete (Type 2) (Seeded Aggregate)
3. Minor Concrete (Type 3) (Colored)

Delete section 73-4.01B

Replace section 73-4.02 with:

73-4.02 MATERIALS

For the types of minor concrete listed in section 73-4.01A:

1. Aggregate must comply with the grading requirements for 1" max. combined aggregate in section 90-1.02C(4)(d).
2. Color the concrete with an integral, chemically inert, fade resistant mineral oxide or synthetic type product. Color must be tan, closely resembling Davis Color No. 5447,"Mesa Buff."

Aggregate used for hand seeding Minor Concrete (Type 2) (Seeded Aggregate) must comply with the following:

1. Grading:

Grading	
Sieve Sizes	Percent Passing
1/4"	100
1/8"	88-100

2. Aggregate to be clean and obtained from a single source.
3. Aggregate must match the color, size and texture of the referee sample #12-015D-SD available for inspection by bidders located at Caltrans District 11 Duty Senior at 4050 Taylor Street, San Diego, California 92110.

Replace section 73-4.03 with:

73-4.03 CONSTRUCTION

73-4.03A General

For the types of minor concrete listed in section 73-4.01A:

1. Protect surrounding exposed surfaces during the placement, finishing and curing operations.
2. Place reinforcing bar as shown.
3. Screed concrete to the grade and cross section shown. Strike-off and compact until a layer of mortar is brought to the surface. Wood float to a uniform surface.
4. Concrete finish, texture and color must be uniform in appearance.

73-4.03B Minor Concrete (Type 1) (Exposed Aggregate)

Comply with the following:

1. Coarse aggregates must be exposed to a depth of approximately 3/16 inch to 3/8 inch.
2. At the option of the Contractor, a concrete set retarder may be applied to the surface of the concrete after placing, consolidating and finishing of the concrete has been completed. The concrete set retarder must be commercial quality, manufactured specifically for use on top of the concrete surface and must be applied per the manufacturer's recommendations. The retarder must effectively retard the setting time of the cement and fine aggregate matrix deep enough and long enough to allow for aggregate exposure.

3. Care must be taken in placing and consolidating the concrete so that the coarse aggregate remains uniformly distributed throughout the concrete.
4. When the concrete mass has set sufficiently to allow for removing the matrix of cement and fine aggregate, the coarse aggregate must be exposed with water spray, coarse brooming, abrasive blasting, or a combination of these methods. Removal methods must not dislodge or loosen the coarse aggregate from the concrete surface.
5. Immediately after the cement mortar has hardened sufficiently to resist further removal, all cement film and loose material must be cleaned from the exposed aggregate surface with stiff brooms and water.
6. Except when operations for exposing the aggregate are underway, concrete shall be cured by the water method in conformance with Section 90-1.03B(2) or with curing compound no.6 in conformance with Section 90-1.03B(3). Areas of concrete where curing compounds are removed during the cure period shall be kept continuously wet until the end of the cure period or until the curing compound is replaced.
7. After the concrete has cured for a minimum of 48 hours, sawcut contraction joint lines to the depth and pattern as shown.

73-4.03C Minor Concrete (Type 2) (Seeded Aggregate)

Comply with the following:

1. Install using the patented cast-in-place Lithocrete process.
2. Only experienced cast-in-place concrete installers, certified in the Lithocrete process are acceptable for this work. Installer must provide proof of certification in the Lithocrete process. If certification is not provided or test panel is unacceptable, installer will not be eligible to install this portion of work.
3. Apply hand seeded aggregate to the concrete surface while the concrete is still in the plastic stage of set.
4. Spread the aggregate evenly over the entire concrete surface and do not allow bare spots.
5. Trowel-tamp the seeded aggregate firmly into the concrete surface.
6. Expose the seeded aggregate and sawcut contraction joints in accordance with the provisions in section 73-4.03B.

73-4.03D Minor Concrete (Type 3) (Colored)

Comply with the following:

1. Broom finish surface of concrete.
2. Hand tool contraction joints to the depth and pattern as shown.

Replace section 73-5 with:

73-5 PARKING BUMPERS

73-5.01 GENERAL

Section 73-5 includes specifications for installing parking bumpers.

73-5.02 MATERIALS

Parking bumper must be precast with concrete and reinforcing steel. Concrete must be minor concrete. Concrete must contain not less than 472 pounds of cementitious material per cubic yard. Parking bumper may be commercially available precast concrete unit. Minor variations in cross sectional dimensions are acceptable in a commercially available unit.

Dowels must be commercial quality reinforcing steel or mild steel rods.

73-5.03 CONSTRUCTION

Not Used

73-5.04 PAYMENT

Not Used

Submit test results signed by your supervisor who performed testing work.

Submit a complete set of as-built drawings within 30 days of installation. Sheets must be 11x17 inches. Paper weight must be 20 lb. Text nominal height must be at least 5/32-inch.

77-1.02 MATERIALS

For materials not specified on the "Approved Materials List for Potable Water, Recycled Water and Sewer Facilities" in the *Information Handout*, requirements are specified in section 77.

Additional requirements for materials on the "Approved Materials List for Potable Water, Recycled Water and Sewer Facilities" in the *Information Handout*, may be described in section 77.

You must provide materials required for Otay Water District to make connections to existing water line mains.

77-1.03 CONSTRUCTION

Existing fire hydrants must be operational during construction activities. If you use water from a fire hydrant an Otay Water District temporary construction meter must be used.

Excavate and backfill under section 19-3.03 except bedding and backfill materials must comply with section 77-2.01B.

You must perform all dry-taps. Connecting to an existing water line main requires the presence of the Engineer and Otay Water District representative.

77-1.04 PAYMENT

Not Used

77-2 WATER

77-2.01 GENERAL

77-2.01A General

Section 77-2 includes general specifications for constructing water supply systems.

77-2.01A(1) Submittals

For the cement-mortar lined and coated steel pipe, elbows, short pipe pieces, reducers, tees, crosses, spools, sections with outlets, beveled sections, submit the following prior to fabrication:

1. Certificate of compliance with AWWA C200 and C205.
2. Tabulated layout schedule including:
 - 2.1 Order of installation and utility closures.
 - 2.2 Pipe station and bottom of pipe elevation at each change of grade and alignment.
 - 2.3 Elements of curves and bends, both in horizontal and vertical alignment.
 - 2.4 Pipe internal diameter, wall thickness, and internal design pressure.
 - 2.5 Locations of bulkheads for field hydrostatic testing.
 - 2.6 Locations of closures, including cut-to-fit allowances, for length adjustment and for construction convenience.
 - 2.7 Locations of valves, flanges, appurtenances and related mechanical equipment.
3. Details of elbows, short pipe pieces, reducers, tees, crosses, spools, sections with outlets, beveled sections, including the lining and coating.
4. Calculations supporting the sizing of reinforcing collar plates, wrapper plates or crotch plates.
5. Calculations supporting selected wall thickness of pipe and elbows, short pipe pieces, reducers, tees, crosses, spools, sections with outlets, beveled sections.
6. Calculations supporting welded joint design and joint welding details.
7. Current shop welder and field welder certifications.
8. Mill test reports on each heat from which steel is rolled, at the discretion of the Engineer.
9. Certification of dye penetrant shop-weld testing.
10. Cathodic protection design and installation details.

For the cathodic protection and joint bonding submit product data for:

1. Wire and cable

2. Copper sulfate reference electrodes
3. Test stations
4. Conduit
5. Exothermic weld molds and charges
6. Pipe flange insulation kits
7. Pipe flange internal coating
8. Wax tape system
9. Plastic warning tape
10. Sacrificial anodes.

Within 7 days after completing water line continuity testing, submit a report completed by your corrosion engineer that includes all calculations of the theoretical resistance and measured pipe resistance for each section of water line tested.

For ductile iron fittings, submit prior to shipping:

1. Certificate of compliance
2. Typical joint details
3. Typical details and description of lining and coating
4. Calculations supporting selected wall thickness
5. Calculations demonstrating that each proposed restrained joint arrangement can resist the applied forces

77-2.01A(2) Quality Control and Assurance

77-2.01A(2)(a) General

You must flush and pressure test new water lines, and test cathodic protection installations in the presence of the Engineer and Otay Water District.

Field and shop welders must be certified in accordance with AWS D1.1.

77-2.01A(2)(b) Hydrostatic Testing of Pressure Water Lines

All water lines must be hydrostatically tested.

Before pressure testing water lines, all piping, valves, fire hydrants, services, and related appurtenances must be installed.

Testing against valves is not permitted.

Notify the Engineer at least 5 business days before performing any pressure test. No pressure test can be performed on weekends or holidays unless authorized.

Hydrostatic testing of water lines in conjunction with the blowoff assemblies, all valves, air valve assemblies and in-line appurtenances must be performed prior to connections to existing water lines.

Before hydrostatic testing:

1. Concrete thrust blocks must cure for a minimum of 72 hours unless an approved accelerating admixture is used
2. Anchor blocks must cure a minimum of 7 days

Steel water lines must not be tested until factory-applied mortar linings and coatings on all pipe lengths have been in place for a minimum of 14 days. Steel water lines with field-applied cement-mortar-lining must not be filled with water until a minimum of 8 hours has elapsed after the final application of cement mortar.

Water lines with cement-mortar lining must be filled with water and placed under a minimum pressure of 25 psi for at least 48 hours prior to hydrostatic testing.

Connections to existing water lines must be tested at line pressure after the existing water line has been refilled.

Do not start testing until the pipe trench is backfilled and compacted to a minimum of 2-1/2 feet above the top of pipe and the anchor, thrust blocks and supporting concrete must have a minimum compressive strength of 2000 psi.

Test the water line in sections determined by the range of elevations in the test section which will result in test pressures within the specified limits. Compute the test pressure at the location of the testing equipment on the basis of the relative elevations of the test gauge and the lowest point in the section being tested.

Test side-outlet-valves with the blind flange bolts loose and the valves uncovered to allow visual inspection during hydrostatic test.

Install a temporary blowoff before hydrostatic testing. After testing, supply and install the connection and equipment necessary to convey the discharge water from the blowoff to a storm drain adequate for the discharge volume.

Connect the test pump and gauge to the water line at a location other than the highest point in the line. Measure the quantity of water pumped into the pipe during, or immediately after, the test period to maintain or restore the initial test pressure. Subject all pipe, fittings, valves, hydrants, services and appurtenances to the hydrostatic test. Correct all leaks.

A 5-hour hydrostatic pressure test must be performed after the pipe and all appurtenances have been installed and after any trench backfill compaction with compaction equipment has been completed. The hydrostatic test pressure must be 50 psi above the class rating of the pipe, or 250 psi, whichever is less, at the highest point in the section of pipe being tested. The hydrostatic test pressure at the highest point in the section of pipe being tested must be within 50 psi of the hydrostatic test pressure at the lowest point in the section of pipe being tested.

The test pressure must be applied and continuously maintained by pumping for a period of 4 hours. During the pumping phase of the test, the test pressure must be maintained at not less than 95 percent of the specified test pressure at all times.

At the end of the fourth hour, the pressure must meet the requirements stated above. Pumping must then be discontinued for one hour and the drop-in-pressure must be recorded. Pumping must then be resumed to restore the initial test pressure, and the quantity of water pumped into the line must be measured. The quantity measured is the amount of pipe leakage, which must not exceed the calculated limits or limits shown on the "Leakage Chart."

Any leak must be repaired at your expense. If the rate of water loss during the test exceeds the acceptable rate, determined by the following, locate the leak and repair.

1. No leakage is allowed for flanged or welded steel pipe or for flanged ductile-iron pipe.
2. Calculate allowable leakage for PVC pipe or for steel or ductile-iron pipe with rubber joints using the following formula:

$$\frac{5 \text{ gallons} \times \text{nominal diameter of pipe (in)} \times \text{length of pipe (ft)}}{24 \text{ (hrs)} \times 5,280 \text{ (ft)}}$$

After repair, perform additional tests until accepted.

The allowable leakage for PVC pipe or for steel or ductile-iron pipe with rubber joints is provided in tabular form from the "Leakage Chart" in the *Information Handout*.

Cap and plug installed to temporarily close ends of new main less than 24 inches in diameter must contain 4-inch outlet with gate valve for temporary blowoff assembly. Valve must protrude free from thrust block and be used for testing and relieving pressure. Cap and outlet is your property and may be claimed after connections are made. You are responsible for removing the cap and plug.

77-2.01B MATERIALS

77-2.01B(1) General

Accelerating admixtures must not be used in concrete for anchor blocks.

77-2.01B(2) Backfill

Structure backfill material for water lines must comply with section 19-3.02 except:

1. The sand equivalent value must be at least 30
2. No more than 10 percent by volume of clay
3. Gradation must comply with the following table:

Sieve size	Percentage passing
1"	100
3/4"	90-100
No. 4	50-95
No. 30	25-45
No. 200	3-15

77-2.01B(3) Bedding

Bedding must comply with section 19-3.02E(2) and have a pH from 6.0 to 8.5, a resistivity of 2,000 ohm-cm or greater, and a soluble sulfate content of 500 ppm or less.

Bedding material must have a sand equivalent of not less than 50 and an expansion coefficient of not more than 0.5 of one percent if saturated with water.

77-2.01B(4) Polyvinyl Chloride Pipe and Fittings

PVC pipes and fittings must comply with AWWA Manual M-23, "PVC Pipe Design and Installation," except:

1. Dimensions for PVC pipe must comply with Table 2 of AWWA C900-07 for CI pipe equivalent OD.
2. Pressure and SDR rating must be class 305 and 14, respectively unless higher pressure class is shown.
3. Pipe ends must be plain by elastomeric gasket bell or plain by plain. Coupling for plain pipe must be furnished with 2 elastomeric gaskets. For pipe to pipe connections, solvent cement, push-on joints or mechanical joints are not allowed.
4. Mechanical joints must conform to Appendix A of AWWA C111. Bolts and nuts must be coated with rust-preventive grease.

Milled-over-all PVC pipe with an equivalent asbestos cement pipe size of 8 through 12-inches may be used only where a shorter than standard length is needed to make a connection to the existing water main.

Recycled water PVC pipe and related gate well casings must be purple.

77-2.01B(5) Copper Pipes

Copper pipes must comply with section 20-3.02M(1).

77-2.01B(6) Brass Pipes and Fittings

Brass pipe, threaded nipples and fittings must comply with ASTM B 43.

Fittings must be compression type.

Threads must comply with ANSI B1.20.1

Service saddles must be the double-strap type.

77-2.01B(7) Combination Air Release and Air/Vacuum Valves

For combination air release and air/vacuum valves the minimum dry film thickness for epoxy linings must be 0.008-inch.

Liquid epoxy lining must comply with AWWA C210 and be applied in 2 coats.

Liquid epoxy lining and coating materials must be listed in the NSF Listing for Drinking Water Additives, Standard 61.

77-2.01B(8) Gate Valves

Delivery and storage of gate valves must comply with AWWA C550.

The port openings must be covered with plastic, cardboard or wood while in transit and during storage in the field. These covers must remain in place until valves are ready to be installed. Valves must not be stored in contact with bare ground. Valves must not be stacked on top of each other or place in contact with bare ground.

Valves must pass dry film thickness and hydrostatic testing and holiday detection prior being delivered to the site. Holiday detection must comply with ASTM D5162.

Valve must be operated from the fully closed to fully-open to fully-closed positions prior to the completed valve being shipped.

Prior to shipment, the manufacturer must provide notarized certification that each gate valve supplied has successfully completed the tests required by AWWA, ANSI, ASTM.

Gate valves must be ductile-iron, complying with AWWA C509 and C515 and the following:

1. Have smooth unobstructed waterways free from any sediment pockets
2. Be leak-tight at their rated pressure
3. Have a non-rising low-zinc bronze or stainless steel stem, opened by turning counterclockwise
4. Stem seals must comply with AWWA C509, must be the O-ring type incorporating a minimum of 2 rings
5. Low-friction torque-reduction thrust washers or bearings must be provided on the stem collar
6. Wedge gate must be fully encapsulated with a bonded-in-place ethylene propylene diene monomer (EPDM) elastomeric covering. Minimum thickness of rubber seating area must be 1/4-inch
7. Gate valves must have a 2-inch square operating nut
8. All bolts and nuts used in the construction of gate valves must be stainless steel, Type 316

Gate valve interior and exterior surfaces, except for the encapsulated disc, must be coated as follows:

1. Epoxy lining and coating of valve surfaces must be performed by the valve manufacturer, comply with AWWA C213, contain 100 percent solids and applied in one or more coats
2. The minimum dry film thickness for epoxy linings must be 0.008-inch
3. Liquid epoxy lining must comply with AWWA C210, applied in 2 coats
4. Epoxy linings and coatings for valves must comply AWWA C550
5. Liquid epoxy lining and coating materials must be listed in the NSF Listing for Drinking Water Additives, Standard 61
6. Repairs made to manufacturer's applied linings must be performed by a company approved by the valve manufacturer, by qualified personnel

77-2.01B(9) Gate Well, Lid, and Extension Stem

Extension stem must be complete with operating nut, location ring, and lower socket to fit the operating nut. The configuration of the extension stem nut must match that of the valve it operates. Valve stem extensions for valves 4-inch or larger must be, round or square, hot-dipped galvanized steel tubing of solid design with guides.

Gate wells for valves 2-inch and smaller must be 4-inch diameter SDR-35 PVC sewer pipe. Gate wells for valves larger than 2-inch must be 8-inch diameter Class 305 C900 PVC pipe.

Gate well lids must be circular ductile-iron and include a skirt for a close fit inside the upper portion of the gate well. Lids must be cast with the words "OTAY WATER DISTRICT" with the word "WATER" for use on potable water systems and the word "RECYCLED" for use on recycled water systems.

Gate wells for use in potable water system applications must be white or blue. Gate wells for use in recycled water system applications must be purple.

77-2.01B(10) Gaskets, Bolts, and Nuts

Bolts and nuts must comply with ANSI B1.1, Class 2A coarse threads.

Bolts will be at a length not less than 1/4-inch or more than 1/2-inch will project past the nut in tightened position.

Rubber-ring gaskets must comply with AWWA C200 according to the applicable joint type and pressure rating of the piping system.

Flange gaskets must comply with AWWA C207. Flange gaskets must be 1/8-inch thick aramid fibers bound with nitrile for all sizes of pipe. Gaskets must be full-face type with pre-punched holes.

Alternate gasket materials or joint treatment to be used when organic solvents or petroleum materials are present.

77-2.01B(11) Welded Steel Pipe Casings

Welded steel pipe casings must comply with AWWA C200, A53 Grade B or API 5L.

Steel pipe casing must be lined and coated with liquid epoxy paint per AWWA C210. Liquid epoxy must be applied in three coats to a minimum thickness of 0.012-inch. The final coat of the liquid epoxy must be white or blue for the potable system, and purple for the recycled system.

77-2.01B(12) Concrete Pipe Supports

Concrete pipe supports must comply with section 70-7.02D.

77-2.01B(13) Seismic Expansion Assemblies

Flexible expansion joints for seismic expansion assembly must be manufactured of ductile iron comply with ASTM A536 and ANSI/AWWA C153/A21.53.

Each flexible expansion joint must be pressure tested prior to shipment against its own restraint to a minimum of 250 PSI. The safety factor must be 2:1 minimum, determined from the published pressure rating must apply.

Each flexible expansion joint must consist of an expansion joint designed and cast as an integral part of a ball and socket type flexible joint, having a minimum expansion of 6 inches and a angle of deflection for the pipe sizes shown in the following table:

Deflection (degrees, min)	Pipe size (inches)
25	4-8
20	10-12
15	14 and larger

The flexible expansion fitting must not expand or exert an axial imparting thrust under internal water pressure. The flexible expansion fitting must not increase or decrease the internal water volume as the unit expands or contracts.

All internal surfaces exposed to water must comply with ANSI/AWWA C213, and must be lined with a minimum of 15 mils of fusion bonded epoxy.

Sealing gaskets must be constructed of EPDM.

The coating and gaskets must comply with ANSI/NSF-61.

Exterior surfaces must comply with ANSI/AWWA C116/A21.16, and be coated with a minimum of 6 mils of fusion bonded epoxy.

Polyethylene sleeves must comply with ANSI/AWWA C105/A21.5, and be included for direct buried applications.

77-2.01B(14) Cathodic Protection

Cathodic protection anodes must be magnesium and manufactured by Dow, Galvo Mag; Kaiser, Electromag; or equal.

Anode test station must be a conduit mounted non-metallic terminal board with integral compression-fit base, screw on cover and fabricated of white polycarbonate. The terminal board must have nickel plated brass factory installed hardware.

Anode test box must be precast concrete box with terminal board and cast iron locking traffic cover marked "ANODE" and be manufactured by Christy, B3; Brooks, 3TL; or equal.

Conductors must be solid no. 12 AWG copper, Type TW or THW, insulation colored black for anode and red for all others.

Fusion weld material must be a mixture of copper oxide and aluminum.

Test box must be a round, precast concrete with dimensions of 14-inch outside diameter by 11-inch high, with a cast iron supporting ring and lid and have enough strength to support vehicular traffic.

The lid must be cast with the legend "Otay Water District Corrosion Test Station" using characters as large as space allows.

Anode test box to have 0.01-A shunts rated at 6 amperes, and manufactured by Holloway Type RS or equal, and accurate to plus or minus 1 percent.

Split bolt connector must be UL 486 copper or brass and sized to match the lead wire and shunt being used.

Identify test lead in each test box with 1-1/2-inch diameter brass tag with a 1/2-inch diameter hole. Die stamp the tag with 1/4-inch high characters. Use uninsulated No 14 copper wire for securing tag to the test lead.

77-2.01B(15) Warning Tape

Warning tape must be an inert, non-metallic plastic film formulated for prolonged underground use that will not degrade if exposed to alkalis, acids, and other destructive substances commonly found in soil.

Tape must be puncture-resistant and must have an elongation of two times its original length before parting.

For water lines and appurtenances the printed message must be in black, the tape color and message to read as follows:

Message	Color
Caution: Waterline Buried Below	Blue
Caution: Recycled Waterline Buried Below	Purple
Caution: Cathodic Protection Cable Buried Below	Red

Ink used to print messages must be permanently fixed to tape and must be black in color with message printed continuously throughout, at approximately 12-inch intervals.

Tape for use to identify below ground recycled water appurtenances must be a minimum 0.004-inch thick and pressure sensitive adhesive backed.

77-2.01B(16) Ductile Iron Fittings

Ductile-iron flanges must have a working pressure of 250 psi.

Maximum working pressure of flanges must comply with AWWA or ASME/ANSI. Flanges must be integrally cast per AWWA C110 or shop-threaded per AWWA C115. Flanges must be solid. Hollow-back flanges are not permitted. Do not use gray-iron or cast-iron fittings or flanges. Threading of flanges in the field is not permitted.

Plain ends must comply with AWWA C151 and the dimensions specified in AWWA C110 to accept a mechanical joint, push-on joint, flanged coupling adaptor, flexible coupling, or grooved coupling.

The exterior surfaces of all fittings must comply with AWWA C110 and C151 and, must be factory coated with a minimum 1 mil thick petroleum asphaltic material.

All fittings must comply with AWWA C104 and must be cement-mortar lined.

Cement-mortar must comply with ASTM C 150, Type II or Type V.

All fittings must have a home mark on the spigot end to indicate proper penetration when the joint is made.

Delivery, storage, and handling of ductile-iron fittings must comply with AWWA C600 and as follows:

1. Gaskets must be stored in a cool location out of direct sunlight. Bolt, nuts, and washers must be handled and stored in a dry location
2. Maintain plastic end caps on all fittings in good condition. Periodically open the plastic end caps and spray clean potable water inside for moisture control
3. Ropes or other handling devices must not be attached through the interior of fittings

77-2.01B(17) Polyethylene Encasement

Polyethylene materials must be kept out of direct sunlight exposure.

77-2.01B(18) Steel Pipe Flanges

Steel pipe flanges must comply with the following:

1. AWWA C207, Class D flanges (matching ANSI/ASME B16.1, Class 125 flanges for bolt hole size and drilling) must be used for pressures up to 150 psi and Class E for pressures between 150 psi and 250 psi
2. AWWA C207, Class F flanges (matching ANSI/ASME B16.1, Class 250 flanges for bolt hole size and drilling) must be used for pressures between 250 psi and 300 psi
3. Flanges must be flat-faced type. Do not use segmented flanges

77-2.01B(19) Couplings

Flexible couplings for plain-end pipe connections must comply with AWWA C200.

Grooved-end or shouldered joint couplings must be installed to comply with AWWA C606.

Steel couplings must comply with ASTM A 36/A 36M, A 53, (Type E or S), or A 512 having a minimum yield strength of 30,000 psi and must have middle rings made of steel.

Follower rings must be ductile-iron comply with ASTM A 536, or steel and must comply with ASTM A 108, Grade 1018 or ASTM A 510, Grade 1018. Minimum middle ring length must be 7-inches for pipe sized 6-inches through 24-inches.

Sleeve bolts must be stainless steel comply with ASTM A 193 and AWWA C111 and, must have a minimum yield strength of 40,000 psi, an ultimate yield strength of 60,000 psi.

Square-cut shouldered or grooved ends must be used and comply with AWWA C606. Grooved-end couplings must be malleable iron per ASTM A 47, or ductile iron per ASTM A 536. Gaskets must comply with ASTM D 2000.

Bolts for exposed service must comply with ASTM A 183, and have a tensile strength of 10,000 psi.

77-2.01B(20) Cement-Mortar Lined & Coated Steel Pipe

Use coatings and linings conforming to AWWA C205, except:

1. Mortar coating thickness must be 1-1/4-inch.
2. Mortar lining thickness for water lines 16-inch and smaller must have a lining thickness of 5/16-inch.

77-2.01B(21) Meter Boxes

Meter box must be 17- by 30-inch for the 2-inch water services and 2-inch blowoff assemblies

Meter box lids for use in potable water system applications must be gray. Meter box lids for use in recycled water system applications must be purple.

77-2.01C CONSTRUCTION

77-2.01C(1) General

Do not connect the potable water system to the recycled water system.

For capping existing water lines, cut the pipe cleanly and fit with a rubber-gasketed ductile-iron solid end-cap specifically designed for the size and type of pipe being temporarily capped. The temporary end cap must be adequately braced with a concrete thrust block poured against undisturbed material, or as otherwise required, to insure that no movement or leakage occurs.

Existing pipe and appurtenances must be completely removed where shown.

Otay Water District will operate water valves and isolate water systems.

Authorization for connection to the existing system will only be given on the basis of acceptable hydrostatic, disinfection and bacteriological tests results.

Warning tape must be used on all underground water lines and appurtenances including cathodic protection wiring systems and tracer wire brought into and out of access ports.

Warning tape must be placed at the top of the pipe zone 12-inch above and centered over the utility intended for identification.

Install tracer wire on all buried water lines and all associated appurtenances for the purpose of providing a continuous signal path used to determine alignment after installation.

Place wire on the top centerline of the water line and run continuously along the entire length of pipe prior to placement of trench backfill. Wire must be mechanically and electrically continuous throughout the pipeline, including within pipe casings.

Secure tracer wire to the water line at 6-foot intervals with plastic adhesive tape.

Install tracer wire access ports within the concrete splash pad of all fire hydrants. In addition, tracer wire may terminate within meter boxes, blowoff boxes, cathodic protection test boxes or air valve enclosures at intervals of not more than 1,000 feet.

Extend tracer wire into the access ports and terminate with a coiled 24-inch length of wire. All tracer wire not attached to water lines must be installed, without splices, within a conduit at a minimum depth of 24 inches.

Avoid splices in tracer wire. If necessary, splices must be made using tracer wire connectors.

You must test tracer wire for electrical continuity in the presence of the Engineer prior to the installation of any paving over water lines or appurtenances. Testing must be accomplished using a device capable of detecting improper connections or ground fault interruptions.

Compact with hand-operated pneumatic tamper, or equivalent in the pipe zone and pipe haunches as shown.

Extend the bedding section from 6 inches below to 12 inches above water lines.

Compact in uniform layers a maximum of 6-inches deep on each side of water lines.

77-2.01C(2) Adjust Water Valves

Adjust water valves under section 15-2.10B.

Install valve stem extension and 8" PVC pipe gate well. Set the pipe over the operating nut and center in place. Keep the extension pipe in a vertical position during backfilling. Slip the valve box frame over the extension pipe, and adjust both to finish grade. Pour a concrete ring around the valve box frame. Valve box and frame must be flush with the pavement finish surface.

77-2.01C(3) Remove Blowoff Assemblies

Remove blowoff assemblies under 15-2.02L.

77-2.01C(4) Install Water Lines

Install all PVC, cement-mortar lined and coated steel, and copper pipe, elbows, short pipe pieces, reducers, tees, crosses, spools, sections with outlets, beveled sections, closure pieces, valves, supports, bolts, nuts, gaskets, jointing materials, and all other appurtenances for water lines.

Do not set PVC or cement-mortar lined and coated steel pipe for water lines on blocks of any kind, including wood, in the trench bottom. If blocking is needed, place sandbags under the pipes. Break sandbags after the haunches are packed.

For cement-mortar lined and coated steel pipe sections, carefully lower each section of pipe into the trench using a sling with a spreading bar so the coating and lining are not damaged by flexure or abrasion. Enter the spigot into the bell or collar and force home. Make the joint carefully to avoid undue stressing or impact damage to the pipe and gasket. Installation by stabbing is not allowed.

The tolerance of each water line joint is plus or minus 1-1/4-inch from the centerline and 1-inch from the elevation shown.

Fill the sling removal holes with bedding material. Securely block the pipe length on its proper alignment and partially backfill the barrel. Keep the space around the joints clear of backfill material on pipe with steel joint rings, to allow completion of the joint work. Remove blocking as soon as the pipe length is firmly held by its partial backfill.

Unless the sheeting or shoring is to be cut off and left in place, compaction for pipes must be accomplished after the sheeting or shoring has been removed from the bedding zone. Alternate methods of pipe bedding which are recommended by the pipe manufacturer may be used if authorized.

If water line support details are shown, the support must be placed as shown regardless of whether or not supporting blocks and welded joints are provided. If water line installation work is not in progress, keep all openings and ends of the pipe tightly closed to prevent entrance of animals and foreign materials. Take precautions to prevent the pipes from floating due to water entering the trench from any source. Restore and replace pipe to its specified condition and grade if it is displaced due to floating.

For cement-mortar lined and steel pipe, allow for pipe expansion from sunlight and welding by leaving unwelded sections of pipe for lengths of 400 feet.

Labels for water lines must be installed on both potable and recycled facilities exposed to view including above ground piping and appurtenances, meter and blowoff box covers, and where shown. Mark the location of all potable and recycled water laterals at the curb crossing by stamping the face of the curb in 2-inch high letters. Recycled water line laterals will be stamped with the letters "RW". Potable water line laterals will be stamped with the letter "W".

77-2.01C(4)(a) Install Couplings

To install couplings, provide joint harnesses per AWWA M11 for above ground applications.

Clean oil, scale, rust, grease and dirt from the pipe ends and touch up the epoxy coating and allow time for curing before installing the coupling. Clean the gaskets before installing.

Follow the manufacturer's recommendations for installation and bolt torque using a properly calibrated torque wrench.

Lubricate the bolt threads with graphite prior to installation.

Grooved-end or shouldered joint couplings must be installed under AWWA C606 and the manufacturer's recommendations.

Clean the gasket before installation. Apply lubricant to the gasket exterior including lips, pipe ends, and housing interiors.

Fasten the coupling alternately and evenly until the coupling halves are seated.

77-2.01C(4)(b) Install Flanged Joints

Before performing flanged joint connections, clean foreign material off bolts, nuts and flange faces with a power wire brush.

Install the flanged joint with the center of the gasket between the mating flanges.

Coat bolt shafts with non-oxide grease or primer for wax tape coating before inserting in flange bolt holes. Do not apply grease or primer to threads. Lubricate bolt and nut threads with non-oxide grease or non-oxide anti-seize before installing. Tighten all bolts and nuts in a progressive diametrically opposite sequence and torque with a calibrated torque wrench. Apply clamping torque to the nuts only.

Coat exposed surfaces, plus nuts and bolts to be buried or made inaccessible with water proof gear grease or primer for wax tape coating. Wrap buried flanges which connect to valves with petroleum wax tape per AWWA C217.

77-2.01C(4)(c) Apply Polyethylene Encasement

Apply polyethylene encasement to all ferrous metal materials not otherwise protectively coated.

Polyethylene wrap or sleeves must be used for the protection of buried ductile-iron pipe, appurtenances, and valves.

Do not apply coating material if the relative humidity exceeds 80 percent or if the surface temperature is less than 5° F. above the dew point.

Surface to be coated must be cleaned as specified in the *"GREENBOOK" Standard Specifications for Public Works Construction*, section 310-2.5.1, part (c).

Polyethylene encasement must completely encase and cover all ferrous metal surfaces.

All ductile iron fittings, including bends, reducers and offsets, must be encased with polyethylene sleeves under AWWA C105, Method A or with polyethylene wrap under AWWA C105, Method C.

Odd-shaped fittings, such as tees and crosses, must be encased with polyethylene wrap under AWWA C105.

Valves must be encased with polyethylene wrap under AWWA C105 such that only the stem and operating nut are exposed and the wrap must be attached so that the valve operation will not disturb the wrapping or break the seal.

Polyethylene sleeves must be secured with polyethylene or vinyl adhesive tape at the ends and quarter point along the sleeve in a manner that will hold the sleeve securely in place during backfill. Polyethylene wrap must be secured with polyethylene or vinyl adhesive tape in a manner that will hold the wrap securely in place during backfill.

77-2.01C(4)(d) Install Concrete Pipe Supports

Before installing pipe supports at locations shown, sandblast the existing concrete surface that will be in contact with the pipe and apply Sikadur 32 or equal structural epoxy adhesive.

Apply an amine cured high build, straight epoxy resin having a solids content of at least 80% by volume, suitable for long term immersion service in potable water and wastewater. For potable water service, the coating material must be listed the NSF International and comply with NSF standard 61B for drinking water system components, health effects.

Apply coating as follows:

1. Prime coat and apply 3 or more finish coats of Amercoat 395, Tnemec 139 or equal until the dry film thickness is at least 16 mils.
2. For coating of valves and non-submerged equipment, dry-film thickness is 12 mils.

Vary the height of supports so the pipe grade is as shown.

Paint the inside concrete curve that will be in contact with pipe with Sikadur 31, minimum 9 mil dry-film thickness.

Provide 4,000 psi minimum compressive strength with 611 pounds Type II/V cement per cubic yard, and water/cement ratio 0.45.

Place the steel galvanized strap over the water line with a 0.5-inch loose fit clearance between strap and water line.

77-2.01C(4)(e) Construct Concrete Anchor, Valve, and Thrust Blocks

Construct concrete thrust, anchor blocks and concrete encasement with minor concrete.

Pour concrete against undisturbed earth. The undisturbed earth must be a plane surface at right angles to the force to be resisted. When pouring concrete, prevent water line floating by temporary braces or internal weighting water line.

Place blocks so joint of pipe and fittings will be accessible for repair.

Thrust blocks must be located at all unrestrained pipe fittings and must bear against firm, undisturbed soil. The thrust blocks must be centered on the fitting so that the bearing area is exactly opposite the resultant direction of the thrust. Thrust block concrete must not hinder maintenance access to the valve operators. Prior to filling the pipeline with water, concrete thrust blocks must cure for a minimum of 72 hours unless an authorized accelerating admixture is used.

For all vertical bends in water lines, including downward bends, that do not have restrained joints the fittings must be held in place by means of an anchor block. Prior to filling the pipeline with water, concrete anchor blocks must cure for a minimum of 7 days. Accelerating admixtures must not be used in concrete anchor blocks.

77-2.01C(4)(f) Connect to Existing Water Line Mains

To facilitate connection to existing water line mains and allow for slight adjustments in alignment, leave a minimum 10-foot gap between new pipe installation and the proposed connection point at the existing water main. You must leave a gap longer than 10 feet if conditions warrant, or if ordered.

The new water line must pass pressure testing, disinfection and bacteriological testing prior to proceeding with the connection to the existing pipeline.

You may proceed with excavation only if pothole of existing water line has been completed, materials have been delivered, wet tap connection has been scheduled and a copy of the approved traffic control plan has been submitted to the Engineer.

After the Engineer has given approval to proceed, you must complete the installation as described below:

1. Disinfect and install pipe sections necessary to make the closure to the new system.
2. Install and set the valve gate wells.
3. Install thrust blocks and anchor blocks.
4. Complete backfill and compaction of the trench.

77-2.01C(4)(g) Perform Field Welded Joints

Field welded joint must be single-welded lap joint and butt strap closure. The minimum overlap of the assembled lap joint must be 3 inches.

Welded joints must be completed in the trench per AWWA C206.

If joint laying surfaces are rusted or pitted where weld metal is to be deposited, clean them by wire brushing or abrasive blast cleaning

Butt strap closure must provide a 4-inch minimum overlap on each of the adjoining pipe ends and maintain a minimum 2-inch joint gap between pipe ends. Butt weld the longitudinal seams of the butt strap with full penetration. Weld before completing the circumferential fillet welds. The longitudinal seams of the butt strap must be offset from the pipe seams by a minimum of 3/4-inch. Do not install butt straps with angular deflections.

Fillet welds must be applied to the exterior joint of lap welded pipe or butt strap closures in successive layers of weld material. Minimum size of fillet weld must be equal to the steel cylinder thickness. Complete each pass around the entire circumference of the pipe before beginning the next pass. Do not deposit more than 1/8-inch of throat thickness per pass. The minimum number of passes or beads in the completed weld must be:

Steel cylinder thickness	Fillet weld minimum number of passes
1/4-inch and Less	2
Greater than 1/4-inch	3

Clean each layer of deposited weld material before depositing the next layer of weld material, including the final pass, by a power-driven wire brush.

Preheat the joints to be welded if required per Table 1 of AWWA C206.

Welding must be done by either the shielded metal arc welding (SMAW) or flux cored gas shielded (FCAW-G) method. The SMAW method must be used on all welds on the exterior side of the pipe joint. Either the SMAW or the FCAW-G method may be used on welds on the interior side of the pipe joint. The air velocity near the weld must not exceed 5 mph if the FCAW-G method is used. SMAW must be applied by continuous stringer beads, with a maximum electrode diameter of 5/32-inch regardless of welding position. For SMAW method, maximum bead width must be 2-1/2 times the electrode diameter and maximum bead thickness must be 1/8-inch. The electrode used on the root pass must be E-6010 run downhill. Use E-7018 electrodes run uphill for the remaining passes. FCAW-G must use an external shielding gas per AWS A5.20, Table 2, and the electrode recommended by the pipe manufacturer. FCAW-G will be applied by continuous stringer beads run uphill. The maximum electrode diameter for FCAW-G must be 5/64-inch. Do not start welding until fit-up has been accepted in writing. Complete and clean each pass around the entire circumference of the pipe or along the seam of the pipe before commencing the next pass. Completed fillet welds must be convex. Only one welder is allowed per weld at any given time. During welding, a welding foreman, certified as a welding inspector, must be onsite at all times.

During welding of exterior joints, protect the welded steel water line coating by draping an 18-inch wide strip of heat-resistant material all around the circumference of the pipe on each side of the coating holdback to avoid damaging the coating by hot weld splatter. Do not use the coated part of the pipe for ground.

Test all single-welded lap joint by the liquid penetrant method and test all butt-strap joints and double-welded joints by the soap and compressed air test after steel is cool to the touch and before completing joint coating or lining. Only individuals qualified per AWS D1.1 for NDT Level I and working under the NDT Level II or individuals qualified for NDT Level II may perform nondestructive testing. Perform all soap and air tests/liquid penetrant tests in the presence of the Engineer. Maintain records of test performed and results of testing for each location.

Use compressed air at maximum 40 psi pressure into the joint, and while the joint is under pressure, swab every portion of every welded seam forming a part of the joint with a heavy soap solution or a commercial bubble-producing leak test fluid. Examine for leakage. Repair any defects disclosed by the test by chipping out, welding the chipped section, and retesting. Drill and tap the necessary test holes, and plug weld the holes after testing.

Conform to the requirements in ASTM E 165. Materials provided must be either water washable or nonflammable. Materials must be "Spotcheck" by the Magnaflux Corporation or "Met-L-Check Flaw-Findr" by the Met-L-Check Company. Chip out defects, weld, and retest the affected section until it shows no leaks or other defects.

77-2.01C(4)(h) Apply Finish to Cement-Mortar Lined and Coated Steel Fittings

For cement-mortar lined and coated steel water line joints, completely fill the outside annular space between pipe joint sections with grout formed by the use of polyethylene foam-lined fabric bands. Flush the outside annular space to be filled with grout with water before grouting so that the surfaces of the joint in contact with the grout will be thoroughly moistened. Fill the joint with grout by pouring from one side only. Grout must be rodded with a wire or other flexible rod or vibrated so that the grout completely fills the joint recess by moving down one side of the pipe, around the bottom of the joint and up the opposite side. Continuously pour and rod the grout to completely fill the entire joint recess in one activity. Do not leave any unfilled space. Grouting of the outside joint spaces must be kept as close behind the laying of the pipe as possible. Grouting must not be closer than three joints to the pipe being laid.

Grout bands or heavy-duty diapers must be polyethylene foam-lined fabric with steel strapping of sufficient strength to hold the fresh mortar, resist nodding of the mortar and allow excess water to escape. Use 100 percent closed cell foam plastic chemically inert, insoluble in water and resistant to acids, alkalis and solvents. Foam Plastic must be Dow Chemical Company, Ethafoam 222 or equal.

77-2.01C(5) Install Valves

Install gate valves with the bolt holes straddling the vertical and horizontal centerlines of pipe, with the operating nut in the vertical position.

Gate valves must be set in true alignment straddling the centerline of pipe with the valve operator in the vertical position or as shown.

Valves must be installed under the manufacturer's recommendations and the applicable section of these special provisions for the piping material and joint type being used.

Above ground valves must be rigidly held in place using supports and hangers. The stem orientation of valves in elevated piping must as ordered for accessibility, except that no valves must be installed with stems aligned below horizontal. Above ground valve support must be saddle type. Supports must be of commercial quality providing at least 120 degrees support under the valve body. Valve supports must be constructed of steel, and must be anchored to the foundations using stainless steel anchor bolts.

Install valve stem extension and 8" PVC pipe gate well. Set the pipe over the operating nut and center in place. Keep the extension pipe in a vertical position during backfilling. Slip the valve box frame over the extension pipe, and adjust both to finish grade. Pour a concrete ring around the valve box frame. Valve box and frame must be flush with the pavement finish surface. Paint the valve box cover with two coats of paint.

77-2.01C(6) Install Blowoff Assemblies

Place copper laterals and specials for blowoff assemblies as shown. Place tracer wire. Backfill blowoff riser with crushed rock. Set meter box and lid to final grade.

77-2.01C(7) Install Combination Air Release & Air/Vacuum Valves

Install combination air release and air/vacuum valve under section 77-2.01C(5). Place copper laterals including fittings, valves, and accessories as shown. Place tracer wire. Set upper portion of riser to at least 3 inches above final grade.

Position the drop in anchors. Place concrete slab under section 73. Install valve and valve enclosure.

77-2.01C(8) Install Seismic Expansion Assembly

Installation of seismic expansion assemblies must comply with section 20-4.03C.

Remove protective end covers and polyethylene sleeves and other materials. Check interior, remove foreign material from interior and end connections.

Assembly of flanged joint connections as follows:

1. Place flange O-ring in groove.
2. Place unit flange against adjoining flange.
3. Check O-ring for proper position.
4. Tighten flange bolts.

Touch-up exterior coating as necessary using coal tar epoxy following manufacturer's instructions.

77-2.01C(9) Construct Welded Steel Pipe Casings

Steel casing sections must be joined by full-circumference butt welding in the field. Steel casing must have all areas of damaged coating repaired.

Carrier pipe must be pushed into the casing incorporating the use of casing spacers as described below.

Upstream and downstream elevations of the carrier pipe must be verified prior to installing the end seals.

The annular space between the carrier pipe and casing must not be filled with any material.

Casing spacers must be used to prevent the carrier pipe bell from touching the casing and to maintain a uniform space between the carrier pipe and casing interior. A minimum of 3 casing spacers must be installed equally spaced, on each pipe section at intervals recommended by the manufacturer.

77-2.01C(10) Construct Cathodic Protection Test Station

Impervious wrapping around the cloth bag of packaged anode must be removed immediately before installing the anode.

The packaged anode must be wetted thoroughly before backfilling. Backfill material must comply with 77-2.01B(3) and placed to 12 inches above the anode.

Conductors must be connected to steel water lines by fusion welding. Connection to the lift post must be located to remain visible. All other connections must be insulated watertight after inspection.

Fusion weld connection to steel surface must be made of molten copper produced by exothermic reaction following ignition of a mixture of copper oxide and aluminum flowing into weld cavity of a properly fitting graphite mold.

Electrical continuity bonding cables must be installed across all buried or submerged metallic inline valves, flexible couplings, grooved couplings, pipe joints that are not circumferentially welded, and all other pipe joints except flange joints equipped with insulation gaskets.

Each conductor must connect only one pipe to a terminal on the terminal board in the anode test box except where otherwise shown.

Conductors for water line must have 12 inches slack at pipe connections and 24 inches slack at the anode test box.

Conductors must be direct buried and located safe from damage due to construction activities.

All metals connected to cathodic protection, except plastic-coated pipes, must be tape-wrapped. Cathodically protected metals must be isolated from all other metals.

Weld alloy must be used for steel pipe. You are responsible for determining the manufacturer's recommended weld charge size for metallic surfaces and considering the type of lining.

Weld caps must be Royston Roybond Primer 747 and Royston Handy Cap 2 or equal.

Do not deform cable. Remove only enough insulation from the cable to allow for the exothermic weld. The wire is to be held at a 30-degree angle to the surface during welding. Only one wire can be attached with each weld.

Remove all coating, dirt, grime and grease from the metal structure by wire brushing. Clean the structure to a bright, shiny surface free of all serious pits and flaws by using a file. The surface area of the structure must be absolutely dry.

After the weld has cooled, test the weld by striking the weld with a 2-pound hammer while pulling firmly on the wire. Clean, re-weld and re-test all unsound welds. Remove all weld slag.

Cold-applied fast-drying mastic consisting of bituminous resin and solvents per Mil. Spec. Mil-C-18480B such as Koppers bitumastic 50 or 505, Tnemec 40-h-413, tape-coat TC mastic or 3M Scotch Clad 244. The minimum coating thickness must be 0.025 inch. The area to be coated must be clean and completely dry. Apply a primer specifically intended for use with an elastomeric weld cap. Apply the weld cap and a bituminous mastic coating material to all exposed areas around the cap per the manufacturer's recommendations. Overlap the structure coating by a minimum of 3 inches.

Repair coatings in the field per the coating manufacturer's recommendations. All coating repairs must be authorized.

Cathodic protection systems must be tested by a corrosion technician certified by the NACE. Tests include:

1. Isolation of protected metal from electrical conduit, piping for water and sewage, fuel island vents, steel buildings, or other metals. If the same potential is measured from a stationary copper-copper

sulphate half cell to any foreign structure as to the protected structure, the protected structure must be deemed to be metallically connected to the foreign structure and the installation must be deemed unacceptable.

2. Anode current.
3. Polarized potential: An instant-off potential of less than 850 millivolts must be deemed to indicate an unacceptable installation. The instant-off potential must be the voltage between the protected structure and a copper-copper sulphate half cell measured after the immediate shift that occurs when anode current is interrupted, but before any further current decay.
4. Anode potential: The anode open-circuit potential must be at least 95 percent of the value listed in the manufacturer's published data for the type of anode furnished.

The tests must be performed after all reinforcing steel, conduits, and water lines have been installed and backfilled or encased.

The test box must be flush with grade. Use San Diego Precast box and lid Model 1BK-SD or equal. Test box mounted in unpaved area must be mounted in a reinforced, 24-inch square by 4-inch thick concrete pad reinforced with no. 4 reinforcement. Set test box in native soil.

77-2.01C(10)(a) Connect Wire to Water Lines

All connection of copper wire to the cathode/structure must be made by the alumino-thermic weld method.

Use a cutter to prevent deforming cable ends. Do not deform cable. Clean oily or greasy cable with a rapid drying solvent leaving no residue. Remove only enough insulation from the cable to allow the alumino-thermic weld connection to be made.

Install electrical continuity bonding cables across all buried or submerged metallic in-line valves, flexible couplings, grooved couplings, pipe joints that are not circumferentially welded, and all other pipe joints except flange joints equipped with insulation gaskets

Remove all coating, dirt, grime, and grease from the metal structure at weld locations by wire brushing and/or use of suitable safe solvents. Clean the structure to a bright, shiny surface free of all serious pits and flaws by using a file. The area to be attached must be absolutely dry.

The wire is to be held at a 30-degree angle to the surface during welding. Only one wire can be attached with each weld.

Remove all weld slag from the weldment with a wire brush.

As soon as the weld has cooled test the weldment for strength by striking a sharp blow with a 2-pound hammer while pulling firmly on the wire. Weld and retest all unsound welds.

Before attempting a weld if a previous weld has failed, it is necessary to completely remove all weld metal and remnants of the previous weld by grinding or filing.

Assure that the area to be coated is thoroughly wire brushed, clean, and completely dry. For all remaining welds, apply an elastomeric weld cap primer and then the weld cap to the weld. Apply a bituminous mastic coating over the weld cap and to all exposed areas around the cap and wires under the manufacturer's recommendations. Overlap this structure coating a minimum of 3 inches. Allow enough time to dry.

77-2.01C(10)(b) Perform Water Line Continuity Tests

Your corrosion engineer must measure the linear resistance of sections of pipe in in-line valve, non-welded pipe joint, or other flanged mechanical joint has been installed. All testing must be performed by the corrosion engineer in the presence of the Engineer.

Measure resistance by the linear resistance method. Impress a direct current from one end of the test section to the other, test station to test station. A voltage drop is measured for several different current levels. The measured resistance is calculated using the equation $R=dV/I$, where dV is the voltage drop between the test span and I is the corresponding current. Measure the resistance for at least 3 different current levels.

Acceptance is determined from a comparison between the measured resistance from the field test data and the theoretical resistance. The theoretical resistance must consider the water line length and wall thickness and the resistance of the bond wires. The measured resistance must not exceed the theoretical resistance by more than 130 percent to determine electrical continuity.

77-2.01C(11) Perform Closed Circuit Television Inspection

Notify the Engineer two business days in advance of the anticipated date of CCTV inspection.

Perform CCTV inspection on newly constructed water lines, including connection, to record physical condition, cleanliness and inspection of joints. Perform CCTV inspection after utilities have been installed and backfill compaction certified, but before final paving.

Furnish all equipment and materials required for inspection. Equipment must comply with the "GREENBOOK" *Standard Specifications for Public Works Construction*, section 500.

Record inspection using a 4 head VHS format VCR recorded in SP or LP modes only. CCTV inspections may be recorded onto digital media such as DVD if authorized.

Repair structural cracking, excessively deflected joints, protruding joint sealing material, corrosion, and any other defect revealed by the CCTV inspection to the satisfaction of the Engineer.

Take video of the repaired section and submit for approval.

77-2.01D PAYMENT

Water lines are measured along the centerline of the water line and parallel with the slope. If water line is cut to fit a structure or slope, the payment quantity is the length necessary to be placed before cutting, measured in 2-foot increments.

77-2.02 POTABLE WATER

77-2.02A General

Section 77-2.02 includes specifications for constructing potable water supply systems.

Notify the Engineer a minimum of 15 days prior to removing existing hydrant

Otay Water District will perform:

1. Bacterial testing for the potable water line and fire hydrant.
2. Wet-tap for connection of the fire hydrant to the potable water line.

Disinfection must be done in the presence of the Engineer and Otay Water District.

Submit a signed disinfection and dechlorination plan, including all methods and equipment to be used.

77-2.02B Materials

77-2.02B(1) Fire Hydrant

Fire hydrants must be bronze.

Appurtenant bury ells and spools must have a six-hole-bolt pattern.

All hydrant outlets must be provided with National Standard Fire-Hose Threads. Outlets must be equipped with brass caps with chains.

All buried nuts and bolts must be stainless steel.

77-2.02B(2) Field Painting and Coating

Select coating products and colors from the following table:

Item	Color	Paint System
Fire hydrant	Safety yellow	Acrylic or epoxy/urethane
Blow off box lids	Safety yellow	Acrylic traffic paint
Gate well lids	Safety yellow	Acrylic traffic paint
Gate well lids- Fire hydrant valves	White	Acrylic traffic paint
Gate well lids- Normally closed valves	Safety red	Acrylic traffic paint
Air/Vac assemblies	Safety yellow	Acrylic or epoxy/urethane
Air/Vac enclosures	Chocolate brown	Fusion bonded polyester
Water test station enclosures	Chocolate brown	Fusion bonded polyester
Normally Closed Valve	Safety Red	Acrylic Traffic Paint

77-2.02C Construction

77-2.02C(1) General

At least one Otay District Water 12-inch potable water main must be in service throughout construction.

The following items or materials are not to be field painted:

1. Buried mortar-coated pipe and fittings
2. Stainless steel
3. Interior surfaces of valves, fittings and pipe
4. Nameplates
5. Grease fittings
6. Brass, copper, bronze, or galvanized items
7. Buried pipe and appurtenances except those listed in section 77-2.03B(3)

77-2.02C(2) Remove Existing Facilities

Remove water meter, blowoff assemblies and combination air release and air/vacuum valve under section 15-2.02L.

77-2.02C(3) Install Fire Hydrants

Install hydrant before removal of existing hydrant.

Remove fire hydrant and lateral pipe under section 15-2.02 and as follows:

1. Disconnect, and remove hydrant and lateral pipe.
2. At existing gate valve cap end with a blind flange.

Install hydrant as follows:

1. Place bedding material under section 77-2.01B(3).
2. Place lateral pipe and fittings under section 77-2.01C(4)..
3. Install gate valve, cap and well under section 77-2.01C(5)..
4. Place warning tape and tracer wire under section 77-2.01C(1).
5. Install thrust block under 77-2.01C(4)E.
6. Install Splash pad under section 73-3.
7. Fire hydrant flange bolts must be set with nuts on top. Torque nuts uniformly and progressively in accordance with the manufacturer's recommendations. Fill the hollow bolt shafts of break-away bolts with silicone sealant.
8. Disinfect system.

All ductile iron fittings must be encased with two layers of 8-mil-thick polyethylene.

77-2.02C(4) Construct Concrete Mat

Construct concrete mat under section 51-7.

77-2.02C(5) Disinfect Potable Water Lines

Disinfect potable water lines in the presence of the Engineer and Otay Water District

Disinfection of water lines is shown on the standard supplemental detail in AWWA, C 651.

Preliminary and final flushing must be done at the ends of the water lines which have been hydrostatically tested.

Do not flush water lines between bacterial tests.

Preliminary and final flushing velocity must comply with section 5.2.2 of AWWA, C 651.

Chlorine must be supplied from liquid chlorine or hypochlorite under section 5.2.2 of AWWA , C 651.

Chlorine application must comply with section 5 of AWWA, C 651.

Chlorine must be applied to the main in enough quantity to obtain a residual chlorine concentration from 50 to 100 mg/l.

Clean and swab valves and fittings with a 5 percent hypochlorite disinfection solution.

Perform a 24-hour chlorine residual test under section 5.2 of AWWA, C 651. Perform final flushing under section 6 of AWWA, C 651 after the Engineer accepts the chlorine residual test.

Otay Water District through the Engineer will take water samples for bacteriological tests under section 7 of AWWA, C 651. You must wait for notification of test results before connecting to the water system.

The disinfection testing procedure is to be repeated if the initial tests fail to produce satisfactory results. Two consecutive satisfactory test results must be performed after a unsatisfactory test. The tablet method must not be used for repeated disinfection.

Pipe and appurtenances used to connect the installed water line must be disinfected under section 9 of AWWA, C 651.

Bacterial sample locations will be taken at a maximum 1200 feet along pipe and at each branch and dead ends.

No hose or fire hydrant is to be used in collecting samples. You must have all curb stops and blowoff assemblies exposed for flushing and sampling.

The chlorinated water must be flushed from the water line following the period of retention. You will be responsible for any damage caused by the disposal of chlorinated water.

If a hypochlorite solution is used for disinfection, flush in an opposite direction than from where the water line is filled.

Neutralizing and disposing of chlorinated water must comply with appendix B of AWWA, C 651.

77-2.02D Payment

Not Used

77-2.03 RECYCLED WATER

77-2.03A General

Section 77-2.03 includes specifications for constructing recycled water systems.

77-2.03B Materials

Recycled water line PVC pipe, valves, related access covers, and polyethylene encasement must be purple.

77-2.03B(1) Field Painting and Coating

Select coating products and colors from the following table

Item	Color	Paint System
Gate well lids	Safety purple	Acrylic traffic paint
Gate well lids – Normally closed valves	Safety red	Acrylic traffic paint
Air/Vac assemblies	Safety purple	Acrylic or epoxy/urethane
Air/Vac enclosures	Safety purple	Fusion bonded polyester
Water test station Enclosures	Safety purple	Fusion bonded polyester
Protector posts	Safety yellow	Acrylic or epoxy/urethane
Vault piping	Safety purple	Acrylic or epoxy
Above ground piping	Safety purple	Acrylic or epoxy/urethane

77-2.03C Construction

77-2.03C(1) General

Place detector tape marked "RECYCLED WATER" 12 inches above and along the entire run of recycled water lines.

Saw-cut existing pavement to a depth of at least 2 inches along the both sides of trench before excavation.

The following items or materials are not to be field painted:

1. Buried mortar-coated pipe and fittings
2. Stainless steel
3. Interior surfaces of valves, fittings and pipe
4. Nameplates
5. Grease fittings
6. Brass, copper, bronze, or galvanized items except as required for recycled water system identification
7. Buried pipe and appurtenances except those listed in section 77-2.03B(2)

77-2.03C(2) Water Meters

Install water meter under section 20-3.02V.

77-2.03D Payment

Not Used

77-3 SEWER

77-3.01 GENERAL

77-3.01A General

Section 77-3 includes specifications for performing sewer work.

77-3.01B Materials

Not Used

77-3.01C Construction

Not Used

77-3.01D Payment

Not Used

77-3.02 ADJUST

77-3.02A General

Not Used

80-4.02 MATERIALS

80-4.02A Wood Posts, Rails and Fence Boards

Each wood post and fence rail must be pressure treated Douglas fir. Pressure treat each post under section 57 and AWPA U1, Use Category UC4A, Commodity Specification A or B.

Each wood fence board must be dog-eared rough sawn Cedar.

All wood must be straight.

All wood must be free from:

1. Decay
2. Shakes over 1/3 the post diameter
3. Splits longer than the thickness or diameter of the post
4. Loose or unsound knots
5. Multiple crooks
6. Other defects that would weaken the wood or otherwise make it structurally unsuitable for the purpose intended

80-4.02B Footings

For concrete at each wood post use:

1. Commercial quality aggregates and cementitious material
2. At least 470 pounds of cementitious material per cubic yard

Crown each concrete footing to shed water.

80-4.03 CONSTRUCTION

80-4.03A Clearing

Remove earth, trees, brush, and other obstructions that interfere with fence (Type 1) construction.

80-4.03B Connections

Connect new fence (Type 1) to existing fences.

80-4.03C Post Placement

Measure post spacing parallel to the ground slope. Place each post in a vertical position.

80-4.03D Surplus Excavated Material

After constructing fence (Type 1), uniformly spread the surplus excavated material along the adjacent roadway where designated by the Engineer.

80-4.04 PAYMENT

The fence (Type 1) is measured:

1. Parallel to the ground slope
2. Along the fence

Add to section 80-10.02

Each pipe gate must be the length shown in the bid item description

Welding must comply with AWS D1.1. Welds must be ground flush with the adjacent surfaces.

Finish all pipe gate metal and hardware in compliance with section 59-3. Color must be grey.

Replace the 13th paragraph of section 80-10.02 with:

Do not attach fence to pipe gate. Install end post and connect fence to it.

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DIVISION IX TRAFFIC CONTROL FACILITIES

83 RAILINGS AND BARRIERS

Replace item 1 in the 7th paragraph of section 83-1.02B with:

1. Wood, steel, or plastic posts

Replace item 2 in the 7th paragraph of section 83-1.02B with:

2. Wood or plastic blocks for line posts

Replace section 83-1.02C(3) with:

83-1.02C(3) Alternative Flared Terminal System

Alternative flared terminal system must be furnished and installed as shown on the plans and under these special provisions.

The allowable alternatives for a flared terminal system must consist of one of the following or a Department-authorized equal.

1. TYPE FLEAT TERMINAL SYSTEM - Type FLEAT terminal system must be a Flared Energy Absorbing Terminal 350 manufactured by Road Systems, Inc., located in Big Spring, Texas, and must include items detailed for Type FLEAT terminal system shown on the plans. The Flared Energy Absorbing Terminal 350 can be obtained from the distributor, Universal Industrial Sales, P.O. Box 699, Pleasant Grove, UT 84062, telephone (801) 785-0505 or from the distributor, Gregory Industries, Inc., 4100 13th Street, S.W., Canton, OH 44708, telephone (330) 477-4800.
2. TYPE SRT TERMINAL SYSTEM - Type SRT terminal system must be an SRT-350 Slotted Rail Terminal (8-post system) as manufactured by Trinity Highway Products, LLC, and must include items detailed for Type SRT terminal system shown on the plans. The SRT-350 Slotted Rail Terminal (8-post system) can be obtained from the manufacturer, Trinity Highway Products, LLC, P.O. Box 99, Centerville, UT 84012, telephone (800) 772-7976.

Submit a certificate of compliance for terminal systems.

Terminal systems must be installed under the manufacturer's installation instructions and these specifications. Each terminal system installed must be identified by painting the type of terminal system in neat black letters and figures 2 inches high on the backside of the rail element between system posts numbers 4 and 5.

For Type SRT terminal system, the steel foundation tubes with soil plates attached must be, at the Contractor's option, either driven, with or without pilot holes, or placed in drilled holes. Space around the steel foundation tubes must be backfilled with selected earth, free of rock, placed in layers approximately 4 inches thick and each layer must be moistened and thoroughly compacted. The wood terminal posts must be inserted into the steel foundation tubes by hand and must not be driven. Before the wood terminal posts are inserted, the inside surfaces of the steel foundation tubes to receive the wood posts must be coated with a grease that will not melt or run at a temperature of 149 degrees F or less. The edges of the wood terminal posts may be slightly rounded to facilitate insertion of the post into the steel foundation tubes.

For Type FLEAT terminal system, the soil tubes must be, at the Contractor's option, driven with or without pilot holes, or placed in drilled holes. Space around the steel foundation tubes must be backfilled with selected earth, free of rock, placed in layers approximately 4 inches thick and each layer must be moistened and thoroughly compacted. Wood posts must be inserted into the steel foundation tubes by

hand. Before the wood terminal posts are inserted, the inside surfaces of the steel foundation tubes to receive the wood posts must be coated with a grease that will not melt or run at a temperature of 149 degrees F or less. The edges of the wood posts may be slightly rounded to facilitate insertion of the post into the steel foundation tubes.

After installing the terminal system, dispose of surplus excavated material in a uniform manner along the adjacent roadway where designated by the Engineer.

Replace the 2nd paragraph of section 83-1.02E with:

Pipe for posts and braces must be standard steel pipe or pipe that complies with section 80-3.02B.

Add to section 83-2.02D(1):

Type 60K portable concrete barrier must consist of interconnected new or undamaged used precast portable concrete barrier units and must comply with the following:

1. Concrete must be minor concrete. Load tickets and a certificate of compliance are not required.
2. Bar reinforcing steel must comply with section 52.
3. Steel plates must comply with ASTM A 36/A 36M. The connection pin must be a round bar complying with ASTM A 36/A 36M. After fabrication, steel plates must be galvanized under section 75-1.05.
4. Final surface finish must comply with section 51-1.03F(2).
5. Exposed surfaces of concrete elements must be cured by the water method, the forms-in-place method, or the curing compound method. The curing compound must be curing compound no. 1.
6. Barrier must have the fabrication date and the Contractor's name or logo on each panel. The fabrication date and name or logo must not be more than 4 inches in height and must be located not more than 12 inches above the bottom of the rail panel.
7. Barrier must be set on firm, stable foundation. The foundation must be graded to provide a uniform bearing throughout the entire length of the railing.
8. Excavation and backfill must comply with section 19-3.
9. Abutting ends of precast concrete units must be placed and maintained in alignment without substantial offset to each other. The precast concrete units must be positioned straight on tangent alignment and on a true arc on curved alignment. The minimum curve radius for the horizontal alignment of the barrier is 164 feet.

Submit a certificate of compliance for all new or used Type 60K portable concrete barrier that is not cast on the job site.

Type 60K portable concrete barrier is measured along the top of the barrier.

Replace the 2nd paragraph of section 83-2.02D(2) with:

Concrete for concrete barriers other than Type 50 and 60 series must contain not less than 630 pounds of cementitious material per cubic yard and must be air entrained. The air content at the time of mixing and before placing must be 3.0 ± 1.0 percent unless a higher air content is specified.

Add between the second and third paragraphs in section 83-2.02D(2):

Concrete for concrete barrier Type 60 (Mod) at RW 285L must be colored. Color must be an integral, chemically inert, fade resistant mineral oxide or synthetic type product, closely resembling Davis color No. 5447, "Mesa Buff".

Replace section 83-2.02E(4) with:

83-2.02E(4) Type REACT Crash Cushion

Type REACT crash cushion must be installed where shown.

Type REACT crash cushion and additional components must comply with the descriptions shown in the following table:

Bid item description	Manufacturer's product description
Type REACT 9CBB crash cushion	REACT 350-36 concrete side mount

The successful bidder can obtain from the following distributors the Type REACT crash cushion manufactured by Energy Absorption Systems, Inc. at 70 W Madison Street, Suite 2350, Chicago, IL 60602, telephone (312) 705-8455, FAX (800) 770-6755:

1. National Trench Safety, 7849 Stockton Blvd, Sacramento, CA 95828, telephone (916) 387-6300, FAX (916) 387-6400.

The price quoted by the manufacturer for Type REACT 9CBB crash cushion, FOB Pell City, Alabama is \$32,000.00, not including sales tax.

1. Optional Debris Cover: Part No. 3535126. The cost of the debris Cover II Assembly, REACT 350, 36", 9 Cylinder is \$1941.33.

The above prices will be firm until January 31, 2013.

The price quoted for Type REACT 9CBB crash cushion includes the concrete anchorage devices, but does not include the concrete anchor slab or the concrete backup block.

Install the crash cushion under the manufacturer's instructions.

Concrete anchorage devices used for attaching the crash cushion to the base slab must be limited to those that have been provided by the manufacturer.

The concrete anchor slab and backup block must comply with sections 51 and 52.

The concrete anchor slab and backup block must be constructed of concrete containing not less than 590 pounds of cementitious material per cubic yard.

Submit a copy of the manufacturer's plan and parts list, for each model installed, as an informational submittal.

Submit a certificate of compliance for each model of Type REACT crash cushion.

Payment for structure excavation, structure backfill, and concrete anchor slab and backup block with bar reinforcing steel is included in the payment for crash cushion (REACT 9CBB).

Replace section 83-2.02E(5) with:

83-2.02E(5) Sand-Filled Crash Cushion

Sand-filled crash cushions must be installed where shown.

A sand-filled crash cushion must consist of an array of sand-filled modules.

Crash cushions must be installed at the following locations:

Rt of Station 311+00 on the "A1" Line.

Modules for use in sand-filled crash cushions must be either of the following, manufactured after March 31, 1997, or equal:

1. Energite III and Fitch Inertial Modules, manufactured by Energy Absorption Systems, Inc., 35 East Wacker Drive, Suite 1100, Chicago, IL 606017-2076:
 - 1.1. Northern California: Traffic Control Service, Inc., 8585 Thys Court, Sacramento, CA 95828, telephone (916) 387-9733, FAX (916) 387-9734

- 1.2. Southern California: Traffic Control Service, Inc., 1818 E. Orangethorpe, Fullerton, CA 92831–5324, telephone (714) 526–9500, FAX (714) 526–9561
2. TraFFix Sand Barrels, manufactured by TraFFix Devices, Inc., 220 Calle Pintoresco, San Clemente, CA 92672, telephone (949) 361–5663, FAX (949) 361–9205:
 - 2.1. Northern California: United Rentals, Inc., 1533 Berger Drive, San Jose, CA 95112, telephone (408) 287–4303, FAX (408) 287–1929
 - 2.2. Southern California: Statewide Safety & Sign, P.O. Box 1440, Pismo Beach, CA 93448, telephone (805) 929–5070, FAX (805) 929–5786
3. CrashGard Model CC-48 Sand Barrels, manufactured by Plastic Safety Systems, Inc., 2444 Baldwin Road, Cleveland, OH 44104:
 - 3.1. Northern California:
 - 3.1.1. Capitol Barricade Inc., 6329 Elvas Avenue, Sacramento, CA 95819, telephone (916) 451–5176, FAX (916) 451–5388
 - 3.1.2. Capitol Barricade Inc., 1661 East Miner Avenue, Stockton, CA 95205, telephone (209) 469–2663, FAX (916) 451–5388
 - 3.1.3. Sierra Safety, 9093 Old State Highway, Newcastle, CA 95658, telephone (916) 663–2026, FAX (916) 663–1858
 - 3.1.4. Alert O Lite, 2020 N Winery Road, Fresno, CA 93703, telephone (559) 486–4570
 - 3.1.5. Stevenson Supply, 3601 Regional Parkway, Santa Rosa, CA 95403, telephone (707) 575–3335
 - 3.2. Southern California: Hi Way Safety Inc., 13310 5th Street, Chino, CA 91710, telephone (909) 591–1781, FAX (909) 627–0999

Modules contained in the crash cushion must be of the same type at each location. The color of the modules must be the standard yellow color as furnished by the vendor, with black lids. The exterior components of the modules must be formulated or processed to resist deterioration from ambient ultraviolet rays. The modules must exhibit good workmanship free from structural flaws and objectionable surface defects.

Submit a certificate of compliance for sand-filled crash cushion.

Sand for filling the modules must be clean washed concrete sand of commercial quality. At the time of placing in the modules, the sand must contain not more than 7 percent water when tested under California Test 226.

Modules placed on bridge decks must be provided with positioning blocks fastened to the deck surface. Positioning blocks must be shaped as segments of a ring and placed along the inner or outer periphery of the module wall. A minimum of 2 blocks, a minimum of one-sixth of a ring in length must be provided for each module. Positioning blocks and fasteners must be of a material that is corrosion and water resistant.

Module cylinders must be filled with sand under the manufacturer's instructions and to the sand capacity in pounds for each module shown.

Lids must be securely attached under the manufacturer's instructions.

A Type R or Type P marker panel must be attached to the front of the crash cushion as shown, if the closest point of the crash cushion array is within 12 feet of the traveled way. The marker panel, if required, must be firmly fastened to the crash cushion with commercial quality hardware or by other authorized methods.

Crash cushion, sand filled is measured from actual count of the units in place, regardless of the number of modules required in each unit.

Replace section 83-2.02E(6) with:

83-2.02E(6) SCI100GM Crash Cushion

The SCI100GM crash cushion must be installed where shown.

For the SCI100GM crash cushion, arrangements have been made to ensure that any successful bidder can obtain the SCI100GM crash cushion from the manufacturer's distributor:

D&M Traffic Services

845 Reed St. Santa Clara CA, 95050

Telephone (408) 436-1127.

The price quoted by the manufacturer for the SCI100GM crash cushion, FOB Morgan, UT is \$20,200.00, not including sales tax.

The price quoted for SCI100GM crash cushion includes the concrete anchorage devices, but does not include the concrete foundation slab or the additional transition panels or transition assemblies that may be required.

The above price will be firm for orders placed on or before July 1, 2013, provided delivery is accepted within 90 days after the order is placed.

Submit a certificate of compliance for SCI100GM crash cushion.

Submit the manufacturer's installation instructions for the SCI100 crash cushion.

Install the crash cushion under the manufacturer's installation instructions. System drawings are available by contacting the distributor.

Concrete anchorage devices used for attaching the crash cushion to the foundation slab must be limited to those provided by the manufacturer.

The structure excavation and structure backfill must comply with section 19-3.

The concrete foundation slab must comply with sections 51 and 52.

The concrete anchor slab must be constructed of concrete containing not less than 590 pounds of cementitious material per cubic yard.

Stripe the full width of the face plate with diagonal stripes conforming to the Type R marker.

After installing the SCI100GM crash cushion, dispose of surplus excavated material in a uniform manner along the adjacent roadway where directed.

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86 ELECTRICAL SYSTEMS

Add to section 86-1.01:

Lighting equipment is included in the following structures:

1. Palomar Street Overcrossing, Bridge No. 57-1222
2. Palomar Street HOV Access Ramp, Bridge No. 1223E

Closed circuit television communication conduit is included in the following structures:

1. Palomar Street Overcrossing, Bridge No. 57-1222

Traffic signal work must be performed at the following locations:

1. Intersection of East Palomar Street and Nacion Avenue.
2. Intersection of East Palomar Street and Route 805 Direct Access Ramps.
3. Intersection of East Palomar Street and Raven Avenue.

Add to section 86-1.03:

Submit a schedule of values within 15 days after Contract approval.

Add to the 4th paragraph of section 86-1.03:

13. Closed circuit television camera assembly
14. Serial to Ethernet conversion unit
15. Video encoder
16. Optical detector/discriminator assembly
17. Video detection unit
18. Video image sensor assembly
19. Video display
20. Communication card
21. Battery for Battery Backup System
22. Fiber optic vault
23. Fiber distribution unit
24. TMS Cabinet
25. CCTV Cabinet

Replace "Reserved" in section 86-1.06B with:

Traffic Management System (TMS) elements include, but are not limited to ramp metering (RM) system, communication system, traffic monitoring stations, video image vehicle detection system (VIVDS), microwave vehicle detection system (MVDS), loop detection system, changeable message sign (CMS) system, extinguishable message sign (EMS) system, highway advisory radio (HAR) system, closed circuit television (CCTV) camera system, roadway weather information system (RWIS), visibility sensor, and fiber optic system.

Existing TMS elements, including detection systems, shown and located within the project limits must remain in place and be protected from damage. If the construction activities require existing TMS elements to be nonoperational or off line, and if temporary or portable TMS elements are not shown, the Contractor must provide for temporary or portable TMS elements. The Contractor must receive authorization on the type of temporary or portable TMS elements and installation method.

Before work is performed, the Engineer, the Contractor, and the Department's Traffic Operations Electrical representatives must jointly conduct a pre-construction operational status check of all existing TMS elements and each element's communication status with the Traffic Management Center (TMC), including existing TMS elements not shown and elements that may not be impacted by the Contractor's activities. The Department's Traffic Operations Electrical representatives will certify the TMS elements' location and status, and provide a copy of the certified list of the existing TMS elements within the project limits to the Contractor. The status list will include the operational, defined as having full functionality, and the nonoperational components.

The Contractor must obtain authorization at least 72 hours before interrupting existing TMS elements' communication with the TMC that will result in the elements being nonoperational or off line. The Contractor must notify the Engineer at least 72 hours before starting excavation activities.

Traffic monitoring stations and their associated communication systems, which were verified to be operational during the pre-construction operational status check, must remain operational on freeway/highway mainline at all times, except:

1. For a duration of up to 15 days on any continuous segment of the freeway/highway longer than 3 miles
2. For a duration of up to 60 days on any continuous segment of the freeway/highway shorter than 3 miles

If the construction activities require existing detection systems to be nonoperational or off line for a longer time period or the spacing between traffic monitoring stations is more than the specified criteria above, and temporary or portable detection operations are not shown, the Contractor must provide provisions for temporary or portable detection operations. The Contractor must receive authorization on the type of detection and installation before installing the temporary or portable detection.

If existing TMS elements shown or identified during the pre-construction operational status check, except traffic monitoring stations, are damaged or fail due to the Contractor's activity, where the elements are not fully functional, the Engineer must be notified immediately. If the Contractor is notified by the Engineer that existing TMS elements have been damaged, have failed or are not fully functional due to the Contractor's activity, the damaged or failed TMS elements, excluding structure-related elements, must be repaired or replaced, at the Contractor's expense, within 24 hours. For a structure-related elements, the Contractor must install temporary or portable TMS elements within 24 hours. For nonstructure-related TMS elements, the Engineer may authorize temporary or portable TMS elements for use during the construction activities.

If fiber optic cables are damaged due to the Contractor's activities, the Contractor must install new fiber optic cables from an original splice point or termination to an original splice point or termination, unless otherwise authorized. Fiber optic cable must be spliced at the splice vaults if available. The amount of new fiber optic cable slack in splice vaults and the number of new fiber optic cable splices must be equivalent to the amount of slack and number of splices existing before the damage or as directed by the Engineer. Fusion splicing will be required.

The Contractor must demonstrate that repaired or replaced elements operate in a manner equal to or better than the replaced equipment. If the Contractor fails to perform required repairs or replacement work, the Department may perform the repair or replacement work and the cost will be deducted from monies due to the Contractor.

A TMS element must be considered nonoperational or off line for the duration of time that active communications with the TMC is disrupted, resulting in messages and commands not transmitted from or to the TMS element.

The Contractor must provide provisions for replacing existing TMS elements within the project limits, including detection systems, that were not identified on the plans or during the pre-construction operational status check that became damaged due to the Contractor's activities.

If the pre-construction operational status check identified existing TMS elements, then the Contractor, the Engineer, and the Department's Traffic Operations Electrical representatives must jointly conduct a post construction operational status check of all existing TMS elements and each element's communication status with the TMC. The Department's Traffic Operations Electrical representatives will certify the TMS

elements' status and provide a copy of the certified list of the existing TMS elements within the project limits to the Contractor. The status list will include the operational, defined as having full functionality, and the nonoperational components. TMS elements that cease to be functional between pre and post construction status checks must be repaired at the Contractor's expense.

The Engineer will authorize the schedule for final replacement, the replacement methods and the replacement elements, including element types and installation methods before repair or replacement work is performed. The final TMS elements must be new and of equal or better quality than the existing TMS elements.

If no electrical work exists on the project and no TMS elements are identified within the project limits, the pre-construction operational status check is change order work.

Furnishing and installing temporary or portable TMS elements that are not shown, but are required when an existing TMS element becomes nonoperational or off line due to construction activities, is change order work.

Furnishing and installing temporary or portable TMS elements and replacing TMS elements that are not shown nor identified during the pre-construction operational status check and were damaged by construction activities is change order work.

If the Contractor is required to submit provisions for the replacement of TMS elements that were not identified, submitting the provisions is change order work.

Add to section 86-2.04A:

The sign mounting hardware must be installed at the locations shown.

Install non-illuminated street name signs on signal mast arms using a minimum 3/4 by 0.020-inch round edge stainless steel strap and saddle bracket. Wrap the strap at least twice around the mast arm, tighten, and secure with a 3/4-inch stainless strap seal. Level the sign panel and tighten the hardware securely.

Set the Type 1 standards with the handhole on the downstream side of the pole in relation to traffic or as shown.

Add to section 86-2.05A:

Conduit installed underground must be Type 3.

Add to section 86-2.05B:

The conduit in a foundation and between a foundation and the nearest pull box must be Type 3.

If Type 3 conduit is placed in a trench, not in the pavement or under concrete sidewalk, after the bedding material is placed and the conduit is installed, backfill the trench to not less than 4 inches above the conduit with minor concrete under section 90-2, except the concrete must contain not less than 421 pounds of cementitious material per cubic yard. Backfill the remaining trench to finished grade with backfill material.

After conductors have been installed, the ends of the conduits must be sealed with an authorized type of sealing compound.

At those locations where conduit is required to be installed under pavement and underground facilities designated as high priority subsurface installation under Govt Code § 4216 et seq. exist, conduit must be placed by the trenching in pavement method under section 86-2.05C.

Replace the 1st sentence of the 15th paragraph of section 86-2.05C with:

With written approval from the Engineer, conduit runs located behind curbs may be installed in the street, within 3 feet of, and parallel with the face of the curb by the trenching in pavement method as specified in section 86-2.05C or as shown in the project plan details.

The final 2 feet of conduit entering a pull box in a reinforced concrete structure may be Type 4.

Add to section 86-2.05:

86-2.05E DIRECTIONAL BORING METHOD

86-2.05E(1) General

This work applies when the directional boring method is shown on the project plans.

86-2.05E(1)(a) Summary

This work includes installing conduit by directional boring method.

Where jacking and drilling is shown on the plans as the required installation method, conduits may be installed by the directional boring method. Do not use the directional boring method at other locations unless approved by the Engineer. Pull box and vault locations must be as shown on the plans.

86-2.05E(1)(b) Submittals

Submit a listing of materials (composition and strength) and methods used in directional boring method for the Engineer's review.

Allow 7 days for the Engineer to review each submittal.

If the Engineer requires revisions, submit a revised submittal within 5 days of receipt of the Engineer's comments and allow 5 days for the Engineer to review. If agreed to by the Engineer, revisions may be included as attachments in the resubmittal. The Engineer may conditionally approve, in writing, resubmittals that include revisions submitted as attachments, in order to allow construction activities to proceed.

Upon the Engineer's approval of the resubmittal, submit copies of the final document (with approved revisions incorporated) to the Engineer.

86-2.05E(2) Materials

The directional boring equipment must have directional control of the boring tool and have an electronic boring tool location detection system. During operation, the directional boring equipment must be able to determine the location of the boring tool both horizontally and vertically.

The directional boring equipment must be equipped with a tension measuring device that indicates the amount of tension exerted on conduit during conduit pulling operations.

The diameter of the boring tool must not exceed 1.5 times the outside diameter of the conduit. Mineral slurry or wetting solution must only be used to lubricate the boring tool and to stabilize the soil surrounding the boring path. Mineral slurry or wetting solution must be water based and environmentally safe.

86-2.05E(3) Construction

Notify the Engineer in writing 2 working days in advance of starting directional boring operations. Include the location and equipment to be used in the directional boring operation in the advance notice to the Engineer.

You or your representative must be in direct charge and control of the directional boring operation at all times.

Perform directional boring in the presence of the Engineer unless otherwise notified in writing by the Engineer.

Residue from directional boring operations must be handled in the same manner as residue from slot cutting operations described in section 86-5.01A(4).

Minimum depth of conduit below finished grade in pavement areas must be 8 feet.

Slurry cement backfill and warning tape are not required where the directional boring method is used.

Attach tracer wire to the uppermost conduit prior to conduit installation. Verify continuity of the tracer wire after installation. Provide the Engineer with a list of conduit installations where continuity has been verified. Include the following information: conduit identification or location, verification date, and who verified by.

86-2.05E(4) Payment

Not used

Add to section 86-2.05:

86-2.05F MULTIDUCT CONDUIT SYSTEM

86-2.05F(1) General

This work applies when multiduct conduit system (MDCS) is shown on the project plans.

86-2.05F(1)(a) Summary

This work includes installing multiduct conduit system.

Multiduct conduit system must use high density polyethylene conduits at underground installations and fiberglass conduit at structure installations.

The size and quantity of conduits are shown on the plans.

Multiduct conduit system trench and backfill requirements must be as shown on the plans and as specified in the special provisions.

86-2.05F(1)(b) Submittals

Not used.

86-2.05F(2) Materials

86-2.05F(2)(a) General

86-2.05F(2)(a)(1) High Density Polyethylene Conduit

86-2.05F(2)(a)(1)(i) General

High density polyethylene conduit must be suitable for "Air Blown Method" as described in the special provisions.

On arrival at the site, conduit with damage in excess of 10 percent of the conduit wall thickness may be rejected by the Engineer. Conduit with damage outside the manufacturer's recommendations for usable conduit may also be rejected by the Engineer. Conduit sections may be repaired if approved by the Engineer. Replacement or repair of rejected conduit is at the Contractor's expense.

86-2.05F(2)(a)(1)(ii) Materials

High density polyethylene (HDPE) conduit must be a minimum of Schedule 40 and comply with ASTM F2160.

High density polyethylene conduit color must be one consistent color furnished for this project: solid orange or black with orange colored stripe. Orange colored stripe must consist of not less than 2 stripes, with longitudinal orientation, evenly spaced.

Ultraviolet stabilizer must be Cb (for black conduit) and E (per ASTM F2160, for colors other than white and black).

86-2.05F(2)(a)(1)(iii) Construction

Conduit must be joined by heat fusion. Heat fusion (includes electrofusion) of high density polyethylene conduit must be by methods recommended by the conduit manufacturer, and with equipment approved for the purpose. Heat fusion must be performed by conduit manufacturer certified or authorized

personnel. A minimum of 2 test fusions, by each fusion operator, must be demonstrated to the Engineer prior to performing fusion operations on any high density polyethylene conduit to be installed.

In addition to the conduit installation methods for Type 3 Conduit, as described in section 86 and in the special provisions, high density polyethylene conduit may be installed by Horizontal Directional Drilling (HDD) (per ASTM F1962 "Standard Guide for Use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit Under Obstacle, Including River Crossings") or "Directional Boring Method" as described in the special provisions. Where there is a difference or conflict between requirements, the higher of the two standards must apply.

86-2.05F(2)(a)(2) Fiberglass Communication Conduit

86-2.05F(2)(a)(2)(i) General

Where communication conduit is to be installed on bridges, fiberglass conduit must be used and must conform to the details shown on the plans and in the special provisions.

Purchase all fiberglass conduit and other fiberglass conduit system components from the same manufacturer to ensure component to component compatibility.

86-2.05F(2)(a)(2)(ii) Materials

Conduit must be continuously marked with clear, distinctive and permanent markings at intervals not greater than 10 feet. The marking must be in a contrasting color to the conduit color. The height of the marking must be approximately 0.1 inch or larger. Conduit marking information must include, as a minimum, the following information:

1. Nominal Size
2. Schedule
3. Manufacturer Name and Product/Model Number
4. Material Code
5. Plant Identification
6. Production Date
7. Cell Classification

All fiberglass conduit components must be free of defects including delaminations, foreign inclusions, etc. All fiberglass conduit components must be nominally uniform (as commercially practical) in color, density, and physical properties. Fiberglass conduit must be straight and the ends must be cut square and true.

Fiberglass conduit must be manufactured in nominal 20-foot minimum lengths.

Fiberglass conduit components must include compatible fittings, adapters, expansion joints, and factory bends at nominal radii of 24-inches and 36-inches.

All materials must be manufactured for use at temperatures from -40°F to 230°F. All fiberglass conduit components must be manufactured using a homogeneously dispersed UV inhibitor. When exposed to direct diurnal sunlight, the UV inhibitor must prevent the degradation of all physical material properties, except for surface cosmetic appearance. Materials must contain no halogens above trace levels and must be fire resistant.

Fiberglass conduit and components must comply with the specifications in ANSI/NEMA Standards Publication TC 14.

The minimum impact resistance must meet UL 1684A or NEMA TC2002 when tested in accordance with ASTM D2444

For stiffness, the deflection of the inside diameter must not exceed 5 percent when tested per ASTM D 2412.

86-2.05F(2)(a)(2)(iii) Construction

Joints must be watertight and withstand a minimum 1000 lbs of pullout tension.

Wrapping tape must be applied to pipe in contact with the earth or concrete and must be a pressure sensitive polyvinyl chloride or polyethylene tape with a minimum thickness of 0.05 inches.

86-2.05F(2)(a)(3) Sealing Plug

86-2.05F(2)(a)(3)(i) General

Except as otherwise noted, multiduct conduit system must have their ends sealed with commercial preformed plugs which prevent the passage of gas, dust and water into the multiduct conduit system.

Plugs for sealing conduit, conductor or cable must be the split type that permits installation or removal without removing conductors or cables.

Sealing plugs must be removable and reusable.

86-2.05F(2)(a)(3)(ii) Materials

Sealing plugs that seal MDCS (4-inch) must seal the conduit and all enclosed conduits simultaneously with one self contained assembly having an adjustable resilient filler of neoprene or silicone rubber clamped between backing ends and compressed with stainless steel hardware.

Sealing plugs must be capable of withstanding a pressure of 5 psi.

A sealing plug that seals an empty conduit must have an eye or other type of capturing device (on the side of the plug that enters the conduit) to attach onto the pull rope so the pull rope will be easily accessible when the plug is removed.

86-2.05F(2)(a)(3)(iii) Construction

Sealing plugs that seal the 1-inch conduits of MDCS must seal each conduit individually with appropriate sizes and configuration to accommodate either empty conduit or those containing cable. Suitable sealing between the varying size cables and the plugs must be provided by inserting split neoprene or silicone adapting sleeves, used singularly or in multiples, within the body of the plugs, or an equivalent method approved by the Engineer.

86-2.05F(2)(a)(4) Tracer Wire

86-2.05F(2)(a)(4)(i) General

Tracer wire must be provided and placed in communication conduits containing fiber optic cable inside a MDCS conduit in the trench.

86-2.05F(2)(a)(4)(ii) Materials

Tracer wire must be No. 12 minimum solid copper conductor with yellow or orange Type TW, THW, RHW, or USE insulation. A minimum of 3 feet slack must be extended into each communication pull box and fiber optic vault from each direction.

86-2.05F(2)(a)(4)(iii) Construction

The tracer wire must form a mechanically and electrically continuous line throughout the length of the trench. Where trenched communication conduit joins metal conduit that has been jacked or drilled, the tracer wire must be bonded to the metal conduit with a brass grounding clamp.

Tracer wire may be spliced at intervals of not less than 500 feet and in pull boxes. Splices must conform to Section 86-2.09, "Wiring," of the Standard Specifications.

86-2.05F(2)(a)(5) Warning Tape

86-2.05F(2)(a)(5)(i) General

Warning tape must be furnished, installed and placed in the trench over new MDCS conduits to receive fiber optic cable, as shown on the plans.

86-2.05F(2)(a)(5)(ii) Materials

Warning tape must not delaminate when it is wet. It must be resistant to insects, acid, alkaline and other corrosive elements in the soil.

The warning tape must have:

Description	Parameter
Thickness	Not less than 4 mil thick
Width	Not less than 3 inches or greater than 6 inches
Material	Pigmented polyolefin film
Tensile strength of material	Minimum of 2700 psi
Elongation	Minimum of 500 percent elongation before breakage
Black Printed Message Text height	0.75 inch to 1 inch
Message background color	Bright orange color background
Message durability	Rated to last the service life of the tape
Message statement	CAUTION: BURIED FIBER OPTIC CABLE - CALTRANS (619) 688-6670,
Message spacing intervals	Approximately 36 inch

86-2.05F(2)(a)(5)(iii) Construction

The printed warning must not be removed by the normal handling and burial of the tape.

86-2.05F(3) Construction

Clean new MDCS conduits with a mandrel or cylindrical soft bristled brush and blow out with compressed air until all foreign material is removed immediately prior to sealing empty conduits or installing cables. Clean conduits in the presence of the Engineer. Seal the ends of MDCS conduits with sealing plugs as specified in the special provisions.

86-2.05F(4) Payment

Not used

Delete items 2–5 in the list in the 2nd paragraph of section 86-2.06A(2).

Add to section 86-2.06A(2):

Do not place grout in the bottom of the pull box.

Replace "Reserved" in section 86-2.06B of the RSS for section 86-2.06 with:

86-2.06B(1) General

86-2.06B(1)(a) Summary

This work includes installing non-traffic-rated pull boxes.

86-2.06B(1)(b) Submittals

Before shipping pull boxes to the jobsite, submit a list of materials, Contract number, pull box manufacturer, manufacturer's instructions for pull box installation, and your contact information to METS.

Submit reports for pull box from an NRTL-accredited lab.

86-2.06B(1)(c) Quality Control and Assurance

86-2.06B(1)(c)(i) General

Pull boxes may be tested by the Department. Deliver pull boxes and covers to METS and allow 30 days for testing. When testing is complete, you will be notified. You must pick up the boxes and covers from the test site and deliver it to the job site.

Any failure of the pull box or the cover that renders the unit noncompliant with these specifications will be a cause for rejection. If the unit is rejected, you must allow 30 days for retesting. Retesting period starts when the replacement pull box is delivered to the test site. You must pay for all retesting costs. Delays

resulting from the submittal of noncompliant materials does not relieve you from executing the Contract within the allotted time.

If the pull box submitted for testing does not comply with the specifications, remove the unit from the test site within 5 business days after notification that it is rejected. If the unit is not removed within that period, it may be shipped to you at your expense.

You must pay for all shipping, handling, and transportation costs related to the testing and retesting.

86-2.06B(1)(c)(ii) Functional Testing

The pull box and cover must be tested under ANSI/SCTE 77, "Specifications for Underground Enclosure Integrity."

86-2.06B(1)(c)(iii) Warranty

Provide a 2-year manufacturer replacement warranty for pull box and cover from the date of installation of the pull box and cover. All warranty documentation must be submitted before installation.

Replacement parts must be provided within 5 business days after receipt of failed pull box, cover, or both at no cost to the Department and must be delivered to the Department at Caltrans District 11 Signal Laboratory, 7181 Opportunity Road, San Diego, CA 92111, telephone (858) 467-4010.

86-2.06B(2) Materials

The pull box and cover must comply with ANSI/SCTE 77, "Specifications for Underground Enclosure Integrity," for Tier 22 load rating and must be gray or brown in color.

Each pull box cover must have an electronic marker cast inside.

Extension for the pull box must be of the same material as the pull box and attached to the pull box to maintain the minimum combined depths as shown.

Include recesses for a hanger if a transformer or other device must be placed in a pull box.

The bolts, nuts, and washers must be a captive bolt design.

The captive bolt design must be capable of withstanding a torque range of 55 to 60 ft-lb and a minimum pull out strength of 750 lb. Perform the test with the cover in place and the bolts torqued. The pull box and cover must not be damaged while performing the test to the minimum pull out strength.

Stainless steel hardware must have an 18 percent chromium content and an 8 percent nickel content.

Galvanize ferrous metal parts under section 75-1-.05.

Manufacturer's instructions must provide guidance on:

1. Quantity and size of entries that can be made without degrading the strength of the pull box below Tier 22 load rating
2. Where side entries cannot be made
3. Acceptable method to be used to create the entry

Tier 22 load rating must be labeled or stenciled by the manufacturer on the inside and outside of the pull box and on the underside of the cover.

86-2.06B(3) Construction

Do not install pull box in curb ramps or driveways.

A pull box for a post or a pole standard must be located within 5 feet of the standard. Place a pull box adjacent to the back of the curb or edge of the shoulder. If this is impractical, place the pull box in a suitable, protected, and accessible location.

Add to section 86-2.06:

86-2.065 FIBER OPTIC VAULT

86-2.065A General

This work applies when fiber optic vault is shown on the project plans.

You must not install additional fiber optic vaults over those shown on the plans without the Engineer's written approval.

86-2.065A(1) Summary

Fiber optic vault, cover and extensions must be of the sizes and details shown on the plans.

Fiber optic vaults and covers must be rated for AASHTO HS 20-44 loads.

Hanger assemblies must consist of not less than 3 hangers evenly distributed. Hangers must be made of a non-corroding material and be free of any sharp edges. Hanger assembly must be provided for a minimum of eight fiber optic cables and be securely fastened to the side wall with the slack fiber optic cable neatly coiled.

86-2.065B Materials

Fiber optic vault must be precast of non-PCC material. Non-PCC material must be resistant to fire , chemicals and ultraviolet exposure. The non-PCC material must show no appreciable change in physical properties with exposure to the weather. Non-PCC material must be dense and free of voids or porosity.

Covers must be the non-skid type. Cover marking must be "CALTRANS FIBER OPTICS" on each cover. Each cover must have inset lifting pull slots. Cover hold down bolts or cap screws and nuts must be of brass, stainless steel, or other non-corroding metal material.

86-2.065C Construction

A reinforced concrete encasement ring must be poured around the collar of the fiber optic vault as shown on the plans. The concrete for encasement ring must contain not less than 548 pounds per cubic yard.

Add to section 86-2.08A:

Wrap conductors around the projecting end of conduit in pull boxes as shown. Secure conductors and cables to the projecting end of the conduit in pull boxes.

Replace the 1st sentence of the 1st paragraph of section 86-2.08E with:

Signal interconnect cable must be the 6-pair type with stranded tinned copper no. 20 conductors.

Add to section 86-2.08:

86-2.08F CATEGORY 5E CABLE

86-2.08F(1) General

86-2.08F(1)(a) Summary

Category 5E cable must be the unshielded, outdoor rated, non-gel filled type, and must meet the requirements of TIA/EIA 568, Category 5E Cable.

86-2.08F(1)(b) Definitions

Not Used

86-2.08F(1)(c) Submittals

Not used.

86-2.08F(1)(d) Quality Control and Assurance

Category 5E Certified installations are required for installed lengths of less than 328 feet of finished cable.

86-2.08F(2) Materials

Category 5E cable must meet the following:

1. The cable must contain 8 conductors, each of which must be No. 24 , minimum, solid bare copper conductors. Each conductor must be insulated with polyolefin, polyethylene, polyvinyl chloride or fluorinated ethylene propylene material.
2. The cable jacket must be rated for a minimum of 300 V and 140°F and must be polyvinyl chloride, polyethylene, polyolefin or fluorinated ethylene propylene. The jacket must be black, gray, or blue. The jacket must be marked as required by NEMA. The jacket must be marked at intervals of not more than 3 feet with the cable identification: manufacturer's name, product identification, number of conductors and conductor size, and voltage and temperature ratings. Cable length markings may be sequentially alternated with the cable identification markings at not more than every other interval.
3. The finished outside diameter of the cable must not exceed 1/2-inch.

86-2.08F(3) Construction

The cable run between components must be continuous without splices. A minimum of 3 feet of slack must be provided at each pull box, junction box or vault, and a minimum of 9 feet at each cabinet.

The ends of category 5E cable terminating at controller and telephone demarcation cabinets must be terminated with Type 110 punch down blocks.

86-2.08F(4) Payment

Not Used

Add to section 86-2.08:

86-2.08G AIR BLOWN METHOD

86-2.08G(1) General

You may install cable into conduit, ducts or subducts using an "Air Blown Method".

86-2.08G(1)(a) Summary

This work includes installing cable into conduit, ducts or subducts with a method that uses a mechanical device combined with a high speed flow of compressed air.

86-2.08G(1)(b) Definitions

Not Used

86-2.08G(1)(c) Submittals

Submit information on the proposed "Air Blown Method" to the Engineer.

Information submittals must include the following:

1. Project description.
2. List or plan sheet marked to identify the conduits and cables involved
3. Equipment description and specifications.
4. Manufacturer's test data covering the performance of the equipment and cable stress in a typical installation using cable equivalent to cable to be installed on this project.
5. User/Installer Manual for the equipment and installation procedures.

Within 30 days after the approval of the contract, submit 2 copies of the proposed "Air Blown Method" to the Engineer.

Allow 7 days for the Engineer to review the proposed "Air Blown Method".

If the Engineer requires revisions, submit a revised "Air Blown Method" within 5 days of receipt of the Engineer's comments and allow 5 days for the Engineer to review. If agreed to by the Engineer, revisions may be included as attachments in the resubmittal. The Engineer may conditionally approve, in writing, resubmittals that include revisions submitted as attachments, in order to allow construction activities to proceed.

Upon the Engineer's approval of the resubmittal, submit 2 copies of the final document (with approved revisions incorporated) to the Engineer.

86-2.08G(1)(d) Quality Control and Assurance

86-2.08G(1)(d)(1) General

The submitted "Air Blown Method" must not be used until it has been approved in writing by the Engineer.

86-2.08G(2) Materials

86-2.08G(2)(a) General

86-2.08G(2)(a)(1) Physical and Mechanical Requirements

The cable installation equipment must also have, at minimum, the following features:

1. Controls to regulate the flow rate of compressed air entering the conduit, duct or subduct, and any hydraulic or pneumatic pressure applied to the cable.
2. Safety shutoff valves to disable the system in the event of sudden changes in pneumatic or hydraulic pressure.
3. Measuring device to determine the speed of the cable during installation and the length of the cable installed.

86-2.08G(3) Construction

Install cable without exceeding the cable manufacturers' tensile and compressive strength ratings.

Use the mechanical device to provide a pushing force on the cable into the conduit.

86-2.08G(4) Payment

Not Used

Add to section 86-2.08:

86-2.08H FIBER OPTIC COMMUNICATION CABLE PLANT

86-2.08H(1) General

This work applies when fiber optic communication cable plant is shown on the project plans.

86-2.08H(1)(a) Summary

Fiber optic communication cable plant consists of installing and testing fiber optic outside plant cable, fiber optic splice enclosure, splice tray, passive cable assemblies and components, and system verification, all as shown on the plans and in the special provisions

86-2.08H(1)(b) Definitions

Breakout. - The cable "breakout" is produced by; (1) removing the jacket just beyond the last tie-wrap point, (2) exposing 3 to 6 feet of the cable buffers, aramid strength yarn and central fiberglass strength member, and (3) cutting the aramid yarn, central strength member and the buffer tubes to expose the individual glass fibers for splicing or connection to the appropriate device.

Connector. - A mechanical device used to align and join two fibers together to provide a means for attaching to and decoupling from a transmitter, receiver, or another fiber (patch panel).

Connectorized. - The termination point of a fiber after connectors have been affixed.

Couplers. - Devices which mate fiber optic connectors to facilitate the transition of optical light signals from one connector into another. They are normally located within FDFs mounted in panels. They may also be used unmounted, to join two simplex fiber runs.

Fiber Distribution Frame (FDF). - A rack mounted system that consists of a standard equipment rack, fiber routing guides, horizontal jumper troughs and Fiber Distribution Unit (FDU).

The FDF serves as the "home" for the passive fiber optic components from cable breakout, for connection by jumpers, to the equipment.

Fiber Distribution Unit (FDU). - An enclosure or rack-mountable unit containing both a patch panel with couplers and a splice tray(s). The unit's patch panel and splice trays may be integrated or separated by a partition.

FO. - Fiber optic.

FOIP. - Fiber optic inside plant cable.

FOP. - Fiber optic outside plant cable.

FOTP. - Fiber optic test procedure(s) as defined by EIA/TIA standards.

Jumper. - A short fiber optic cable that has connectors installed on both ends, and is typically used to join two CMH couplers or a CMH to active electronic components.

Light Source. - Portable fiber optic test equipment that, in conjunction with a power meter, is used to perform end-to-end attenuation testing. It contains a stabilized light source operating at the designed wavelength of the system under test. It also couples light from the source into the fiber to be received at the far end by the receiver.

Link. - A passive section of the system, the ends of which are to be connected to active components. A link may include splices and couplers. For example, a video link from a FO transmitter to a video multiplexer (MUX).

Link Loss Budget. - A calculation of the overall permissible attenuation from the fiber optic transmitter (source) to the fiber optic receiver (detector).

Loose Tube Cable. - Type of cable construction in which fibers are placed in filled buffer tubes to isolate them from outside forces (stress). A flooding compound is applied to the interstitial cable core to prevent water migration and penetration. This type of cable is primarily for outdoor applications.

Optical Time Domain Reflectometer (OTDR). - Fiber optic test equipment (similar in appearance to an oscilloscope) that is used to measure the total amount of power loss between two points and the corresponding distance. It provides a visual and printed display of the relative location of system components such as fiber sections, splices and connectors and the losses that are attributed to each component or defect in the fiber, splices and connectors.

Patchcord. - A short jumper used to join two Connector Module Housing (CMH) couplers and or a CMH and an active device (electronics).

Pigtail. - A short length of fiber optical cable permanently connectorized on only one end to a source, detector, or other fiber optic device. All pigtails must be tight buffer cable.

Power Meter. - Portable fiber optic test equipment that, in conjunction with a light source, is used to perform end-to-end attenuation testing. It contains a detector that is sensitive to light at the designed wavelength of the system under test. Its display indicates the amount of power injected by the light source that arrives at the receiving end of the link.

Segment. - A section of F/O cable that is not connected to any active device and may or may not have splices per the design.

Splice. - The permanent joining of fiber ends to identical or similar fibers.

Splice Enclosure. - A environmentally sealed container used to organize and protect splice trays. The container allows splitting or routing of fiber cables from multiple locations. It is normally installed in a splice vault.

Splice Module Housing (SMH). - A unit that stores splice trays as well as pigtails and short cable lengths. The unit allows splitting or routing of fiber cables to or from multiple locations.

Splice Tray. - A container used to organize and protect spliced fibers.

Splice Vault. - An underground container used to house excess cable and/or splice enclosures.

Storage Cabinet. - Designed for holding excess cable slack for protection. The storage cabinet allows the user flexibility in equipment location and the ability to pull cable back for resplicing.

Tight Buffered. - Type of non-breakout cable construction where each glass fiber is tightly buffered (directly coated) with a protective thermoplastic coating to 900 µm (compared to 250 µm for loose tube fibers).

86-2.08H(1)(c) Submittals

A minimum of 10 working days before the scheduled delivery of the fiber optic outside plant cable to the project site, submit documentation of detailed factory test procedures and results for the Engineer's review and approval.

The procedures must identify the cable tests performed and conducted. Included in the test procedures must be the model, manufacturer, configuration, calibration and alignment and operating procedures for all proposed test equipment.

Submit two copies of the manufacturer's cable installation procedures and technical support information to the Engineer at least two weeks before the scheduled delivery of the cable to the project site.

86-2.08H(1)(d) Quality Control and Assurance

Testing must include the tests on elements of the passive fiber optic components: (1) at the factory, (2) after delivery to the project site but prior to installation, (3) after installation and (4) during final system testing. Test the active components after installation.

You must provide all personnel, equipment, instrumentation and materials necessary to perform all field testing. Notify the Engineer two working days prior to all field tests. The notification must include the exact location or portion of the system to be tested.

86-2.08H(1)(d)(i) Factory Testing

You must provide the documentation from the original cable manufacturer for the factory testing and of compliance with the fiber specifications as listed in the Fiber Characteristics Table. Before shipment, but while on the shipping reel, 100 percent of all fibers must be tested for attenuation. Test results must be recorded and dated. Copies of the results must be (1) maintained on file by the manufacturer with a file identification number for a minimum of seven years, (2) attached to the cable reel in a waterproof pouch, and (3) You must provide a copy to the Engineer. Copies of the test results must also be filed with the copy accompanying the shipping reel in a separate weather proof envelope.

86-2.08H(1)(d)(ii) Arrival on Site

Physically inspect the cable and reel on delivery.

Measure the attenuation for 100 percent of the fibers to confirm that the cable meets requirements. Singlemode fibers must be tested at 1310 nm and 1550 nm after arrival on site. Attenuation readings in one direction must be recorded on the cable data sheet.

Test results must be recorded, dated, compared to the detailed factory test results documents, and submitted to the Engineer.

Attenuation deviations from the shipping records of greater than 5 percent must be brought to the attention of the Engineer. The cable must not be installed until completion of this test sequence and the Engineer provides written approval.

The failure of any single fiber in the cable to comply with the special provisions is cause for rejection of the entire reel.

If the test results are unsatisfactory, the reel of fiber optic cable must be considered unacceptable and all records corresponding to that reel of cable must be marked accordingly. Replace the unsatisfactory reels of cable with new reels of cable at your expense. Test the new reels of cable to demonstrate acceptability. Submit copies of the test results to the Engineer.

Allow 5 working days for the Engineer to review the "arrival on site test" results and notify you of the results of the review.

86-2.08H(1)(d)(iii) After Cable Installation

After the fiber optic cable has been pulled but before breakout and termination, test 100 percent of all the fibers with an OTDR for attenuation.

Singlemode fibers must be tested at 1310 nm and 1550 nm after cable installation. Attenuation readings for each direction must be recorded on the cable data sheet.

Test results must be recorded, dated, and compared to the detailed test procedures documents at the factory. Submit copies of traces and test results to the Engineer.

If the OTDR test results are unsatisfactory, the F/O cable segment will be unacceptable. Replace the unsatisfactory segment of cable with a new segment, without additional splices, at the your expense. Test the new segment of cable to demonstrate acceptability. Submit copies of the test results to the Engineer.

Allow 10 working days for the Engineer to review the "after cable installation test" results and notify you of the results of the review.

86-2.08H(1)(d)(iv) Outdoor Splices

At the conclusion of all outdoor splices at one location, and before they are enclosed and sealed, test all splices with the OTDR, in both directions. Splices in segments must be tested at 1310 nm and at 1550 nm. Individual fusion splice losses must not exceed 0.07 dB. Measurement results must be recorded, dated, validated by the OTDR trace printout and filed with the records of the respective cable runs. Submit copies of traces and test results to the Engineer. If the OTDR test results are unsatisfactory, the splice is unacceptable. Replace the unsatisfactory splice at the your expense. Test the new splice to demonstrate acceptability. Submit copies of the test results to the Engineer.

86-2.08H(1)(d)(v) Passive Interconnect Package Testing and Documentation

All the components of the passive interconnect package (FDUs, pigtails, jumpers, couplers and splice trays as shown on the plans and in the special provisions) must comprise a unit from a manufacturer who is regularly engaged in the production of the fiber optic components.

In developing the passive interconnect package, each SC termination (pigtail or jumper) must be tested for insertion attenuation loss with the use of an optical power meter and light source. In addition, all singlemode terminations must be tested for return reflection loss. These values must meet the loss requirements specified earlier and must be recorded on a tag attached to the pigtail or jumper.

Once assembly is complete, the manufacturer must visually verify that all tagging, including loss values, is complete. Then as a final quality control measure, the manufacturer must do an "end to end" optical power meter/light source test from pigtail end to jumper lead end to assure continuity and overall attenuation loss values.

The final test results must be recorded, along with previous individual component values, on a special form assigned to each FDU. The completed form must be dated and signed by the Manufacturer's Quality Control supervisor. One copy of this form will be attached in a plastic envelope to the assembled FDU unit. Copies will be provided separately to you and to the Engineer, and must be also be maintained on file by the manufacturer or supplier.

86-2.08H(1)(d)(vi) System Verification at Completion

OTDR Testing. - Once the passive cabling system has been installed and is ready for activation, test 100 percent of the fiber links with the OTDR for attenuation. Print out must include at least link number, fiber color, buffer color and cable number. Test results must be recorded, dated, compared and filed with previous copies. Submit a hard copy printout and a electronic copy of the traces and test results along with a licensed copy of the associated software on a Windows XP PC compatible CD to the Engineer. If the OTDR test results are unsatisfactory, replace the link at your expense. Test the new link to demonstrate acceptability. Submit copies of the test results to the Engineer.

Power Meter and Light Source. - At the conclusion of the final OTDR testing, test 100 percent of all fiber links end to end, with a power meter and light source, in accordance with EIA Optical Test Procedure 171 and in the same wavelengths specified for the OTDR tests. Conduct these tests in both directions. Test results must be recorded, compared and proven to be within the design link loss budgets, and filed with the other recordings of the same links. Submit copies of the test results to the Engineer.

Link Loss Budget Worksheet. - The Link Loss Budget Worksheet shown in Appendix A must be completed for 100 percent of all links in the fiber optic system, using the data gathered during cable verification. Include the completed worksheets as part of the system documentation.

Test Failures. - If the link loss measured from the power meter and light source exceeds the calculated link loss, or the actual location of the fiber ends does not agree with the expected location of the fiber ends (as would occur with a broken fiber), the fiber optic link will not be accepted. Replace the unsatisfactory segments of cable or splices with a new segment of cable or splice at your expense. The OTDR testing, power meter and light source testing and Link Loss Budget Worksheet must be completed for the repaired link to determine acceptability. Submit copies of the test results to the Engineer. The removal and replacement of a segment of cable must be interpreted as the removal and replacement of a single contiguous length of cable connecting two splices, two connectors or one splice and one connector. The removal of only the small section containing the failure and therefore introducing new unplanned splices, will not be allowed.

APPENDIX A

Link Loss Budget Worksheet

Contract No. _____ Contractor: _____

Approved by Caltrans: _____

Date: _____ Operator: _____

Link Number: _____ Fiber Color: _____

Buffer Color: _____ Cable No.: _____

Test Wavelength (Circle one): 1310 1550

Expected Location of fiber ends: End 1: _____ End 2: _____

OTDR Test Results: Forward Loss: Reverse Loss: Average Loss:	_____ dB _____ dB _____ dB	1A 1B 1C
Power Meter and Light Source Test Results: Forward Loss: Reverse Loss: Average Loss [(2A + 2B)/2]:	_____ dB _____ dB _____ dB	2A 2B 2C
Calculated Fiber Loss: Length of the link (from OTDR): Allowed loss per km of fiber: Total Allowed Loss due to the fiber (3A * 3B):	_____ km 0.4 dB/km _____ dB	3A 3B 3C
Calculated Splice Loss: Number of Splices in the Link: Allowed Link Loss per Splice: Total Allowed Loss due to Splices (4A * 4B):	_____ dB 0.07 dB _____ dB	4A 4B 4C
Calculated Link Loss: Connector Loss: Total Link Loss (5A + 3C + 4C):	0.9 dB _____ dB	5A 5B
Cable Verification: Compare Power Meter Average Loss to Calculated Link Loss (2C - 5B): If the value of 6A is greater than zero, the link has failed the Test. See "Test Failures" in these special provisions.	_____ dB	6A

To Be Completed by Caltrans:

Resident Engineer's Signature: _____

Cable Link Accepted: _____

86-2.08H(2) Materials

86-2.08H(2)(a) Fiber Optic Outside Plant Cable

86-2.08H(2)(a)(i) General

Each fiber optic outside plant cable (FOP) for this project must be all dielectric, non-gel water blocking materials, duct type, with loose buffer tubes and must conform to the special provisions. Cables with singlemode fibers must contain singlemode (SM) dual-window (1310 nm and 1550 nm) fibers in the quantities shown below and on the plans.

Quantity	Cable
12	SMFO
144	SMFO

The optical fibers must be contained within loose buffer tubes. The loose buffer tubes must be stranded around an all dielectric central member. Aramid yarn or fiberglass must be used as a primary strength member, and a polyethylene outside jacket must provide for overall protection.

All fiber optic (F/O) cable on this project must be from the same manufacturer, who is regularly engaged in the production of this material.

The cable must comply with all the requirements of RUS-Chapter XVII, Title 7, Section 1755.900 and as specified in the special Provisions.

86-2.08H(2)(a)(ii) Materials

Each optical fiber must be glass and consist of a doped silica core surrounded by concentric silica cladding. All fibers in the buffer tube must be usable fibers, and must be sufficiently free of surface imperfections and inclusions to meet the optical, mechanical, and environmental requirements of these specifications. The required fiber grade SM must reflect the maximum individual fiber attenuation, to guarantee the required performance of each and every fiber in the cable. The coating must be a dual layered, UV cured acrylate. The coating must be mechanically or chemically strippable without damaging the fiber. The cable must comply with the optical and mechanical requirements over an operating temperature range from -40 to +70 °C. The cable must be tested in accordance with EIA-455-3A (FOTP-3), "Procedure to Measure Temperature Cycling Effects on Optical Fiber, Optical Cable, and Other Passive Fiber Optic Components." The change in attenuation at extreme operational temperatures (from -40 to +70 °C) for singlemode fiber must not be greater than 0.20 dB/km, with 80 percent of the measured values no greater than 0.10 dB/km. The singlemode fiber measurement is made at 1550 nm. For all fibers the attenuation specification must be a maximum attenuation for each fiber over the entire operating temperature range of the cable.

Singlemode fibers within the finished cable must meet the requirements in the following table:

Parameter	Singlemode
Type	Step Index
Core diameter	8.3 μm (nominal)
Cladding diameter	125 μm ±1.0 μm
Core to Cladding Offset	≤1.0μm
Coating Diameter	250 μm ±15 μm
Cladding Non-circularity defined as: [1-(Min cladding Dia ÷Max cladding Dia.)]x100	≤2.0 percent
Proof/Tensile Test	
Attenuation: (-40 to +70 °C) @1310 nm @1550 nm	≤0.4 dB/km ≤0.3 dB/km
Attenuation at the Water Peak	≤2.1 dB/km @ 1383 ±3 nm
Chromatic Dispersion: Zero Dispersion Wavelength Zero Dispersion Slope	1301.5 to 1321.5 nm ≤0.092 ps/(nm ² *km)
Maximum Dispersion:	≤3.3 ps/(nm*km) for 1285 – 1330 nm <18 ps/(nm*km) for 1550 nm
Cut-Off Wavelength	<1260 nm
Mode Field Diameter (Petermann II)	9.3 ±0.5 μm at 1300 nm 10.5 ±1.0 μm at 1550 nm

86-2.08H(2)(a)(iii) Fiber Color Coding

Optical fibers must be distinguishable from others in the same buffer tube by means of color coding according to the following:

1. Blue (BL)	7. Red (RD)
2. Orange (OR)	8. Black (BK)
3. Green (GR)	9. Yellow (YL)
4. Brown (BR)	10. Violet (VL)
5. Slate (SL)	11. Rose (RS)
6. White (WT)	12. Aqua (AQ)

The colors must be targeted in accordance with the Munsell color shades and must meet EIA/TIA-598 "Color Coding of Fiber Optic Cables."

Buffer tubes containing fibers must also be color coded with distinct and recognizable colors according to the same table listed above for fibers.

The color formulation must be compatible with the fiber coating and the buffer tube filling compound, and be heat stable. It must not fade or smear or be susceptible to migration and it must not affect the transmission characteristics of the optical fibers and must not cause fibers to stick together.

Submit a manufacturer's sample of fiber optic cable, 10 feet in length, with part numbers and original catalog and documents, to the Engineer.

86-2.08H(2)(a)(iv) Cable Construction

86-2.08H(2)(a)(iv)(a) General

The fiber optic cable must consist of, but not be limited to, the following components:

1. Buffer tubes
2. Central member
3. Filler rods
4. Stranding
5. Core and cable flooding
6. Tensile strength member
7. Ripcord
8. Outer jacket

Buffer Tubes. - Loose buffer tubes must provide clearance between the fibers and the inside of the tube to allow for expansion without constraining the fiber. The fibers must be loose or suspended within the tubes and must not adhere to the inside of the tube. Each buffer tube must contain 6 or 12 fibers.

The loose buffer tubes must be extruded from a material having a coefficient of friction sufficiently low to allow free movement of the fibers. The material must be tough and abrasion resistant to provide mechanical and environmental protection of the fibers, yet designed to permit safe intentional "scoring" and breakout, without damaging or degrading the internal fibers.

Buffer tube must have a non-gel water-blocking material used to prevent water intrusion and migration. The filling compound must be non-toxic and dermatologically safe to exposed skin. It must be chemically and mechanically compatible with all cable components, non-nutritive to fungus, non-hygroscopic and electrically non-conductive. The filling compound must be free from dirt and foreign matter and must be readily removable with conventional nontoxic solvents.

Buffer tubes must be stranded around a central member by a method that will prevent stress on the fibers when the cable jacket is placed under strain, such as the reverse oscillation stranding process.

Central Member. - The central member which functions as an anti-buckling element must be a glass reinforced plastic rod with similar expansion and contraction characteristics as the optical fibers and buffer tubes. A linear overcoat of low density polyethylene must be applied to the central member to achieve the optimum diameter to provide the proper spacing between buffer tubes during stranding.

Filler Rods. - Filler rods may be included in the cable to lend symmetry to the cable cross-section where needed. Filler rods must be solid medium or high density polyethylene. The diameter of filler rods must be the same as the outer diameter of the buffer tubes.

Stranding. - Completed buffer tubes must be stranded around the overcoated central member using stranding methods, lay lengths and positioning such that the cable must meet mechanical, environmental and performance specifications. A polyester binding must be applied over the stranded buffer tubes to hold them in place. Binders must be applied using tension sufficient to secure the buffer tubes to the central member without crushing the buffer tubes. The binders must be non-hygroscopic, non-wicking (or rendered so by the flooding compound), and dielectric with low shrinkage.

Core and Cable Flooding. - The cable core interstices must be filled with a polyolefin based compound to prevent water ingress and migration. The flooding compound must be homogeneous, non-hygroscopic, electrically non-conductive, and non-nutritive to fungus. The compound must also be nontoxic, dermatologically safe and compatible with all other cable components.

Tensile Strength Member. - Tensile strength must be provided by high tensile strength aramid yarns or fiberglass which must be helically stranded evenly around the cable core and must not adhere to other cable components.

Ripcord. - The cable must contain at least one ripcord under the jacket for easy sheath removal.

Outer Jacket. - The jacket must be free of holes, splits, and blisters and must be medium or high density polyethylene (PE), or medium density cross-linked polyethylene with minimum nominal jacket thickness of 40.0 ± 3 mil. Jacketing material must be applied directly over the tensile strength members and flooding compound and must not adhere to the aramid strength material. The polyethylene must contain carbon black to provide ultraviolet light protection and must not promote the growth of fungus.

The jacket or sheath must have clear, distinctive and permanent markings showing the manufacturer's name, the words "Optical Cable", the number of fibers, "SM", year of manufacture, and sequential measurement markings every 3 feet. The actual length of the cable must be within $-0/+1$ percent of the length marking. The marking must be in a contrasting color to the cable jacket. The height of the marking must be approximately 0.1-inch.

86-2.08H(2)(a)(v) Functional Requirements

The F/O cable must withstand water penetration when tested with a one meter static head or equivalent continuous pressure applied at one end of a 3-foot length of filled cable for one hour. No water must leak through the open cable end. Testing must be done in accordance with ANSI/EIA-455-82 (FOTP-82), "Fluid Penetration Test for Fluid-Blocked Fiber Optic Cable."

A representative sample of cable must be tested in accordance with ANSI/EIA/TIA-455-81A "Compound Flow (Drip) Test for Filled Fiber Optic Cable". The test sample must be prepared in accordance with Method A. No preconditioning period must be conducted. The cable must exhibit no flow (drip or leak) at 70°C as defined in the test method.

Crush resistance of the finished F/O cables must be 220 N/cm applied uniformly over the length of the cable without showing evidence of cracking or splitting when tested in accordance with EIA-455-41 (FOTP-41), "Compressive Loading Resistance of Fiber Optic Cables." The average increase in attenuation for the fibers must be ≤ 0.10 dB at 1550 nm (singlemode) for a cable subjected to this load. The cable must not exhibit any measurable increase in attenuation after removal of load. Testing must be in accordance with EIA-455-41 (FOTP-41), except that the load must be applied at the rate from 0.10 to 0.75 inch per minute and maintained for 10 minutes.

The cable must withstand 25 cycles of mechanical flexing at a rate of 30 ± 1 cycles/minute. The average increase in attenuation for the fibers must be ≤ 0.20 dB at 1550 nm (singlemode) at the completion of the test. Outer cable jacket cracking or splitting observed under 10x magnification constitutes failure. The test must be conducted in accordance with EIA-455-104 (FOTP-104), "Fiber Optic Cable Cyclic Flexing Test," with the sheave diameter a maximum of 20 times the outside diameter of the cable. The cable must be tested in accordance with Test Conditions I and II of (FOTP-104).

The cable must withstand 20 impact cycles. The average increase in attenuation for the fibers must be ≤ 0.20 dB at 1550 nm (singlemode). The cable jacket must not exhibit evidence of cracking or splitting.

The test must be conducted in accordance with EIA-455-25 (FOTP-25), "Impact Testing of Fiber Optic Cables and Cable Assemblies."

The finished cable must withstand a tensile load of 610 pounds without exhibiting an average increase in attenuation of greater than 0.20 dB. The test must be conducted in accordance with EIA-455-33 (FOTP-33), "Fiber Optic Cable Tensile Loading and Bending Test." The load must be applied for one-half hour in Test Condition II of the EIA-455-33 (FOTP-33) procedure.

86-2.08H(2)(a)(vi) Packaging and Shipping Requirements

The completed cable must be packaged for shipment on reels. The cable must be wrapped in a weather and temperature resistant covering. Both ends of the cable must be sealed to prevent the ingress of moisture.

Each end of the cable must be securely fastened to the reel to prevent the cable from coming loose during transit. Ten feet of cable length on each end of the cable must be accessible for testing.

Each cable reel must have a durable weatherproof label or tag showing the manufacturer's name, the cable type, the actual length of cable on the reel, your name, the contract number, and the reel number. A shipping record must also be included in a weatherproof envelope showing the above information and also include the date of manufacture, cable characteristics (size, attenuation, bandwidth, etc.), factory test results, cable identification number and any other pertinent information.

The minimum hub diameter of the reel must be at least thirty times the diameter of the cable. The F/O cable must be in one continuous length per reel with no factory splices in the fiber. Each reel must be marked to indicate the direction the reel should be rolled to prevent loosening of the cable.

86-2.08H(2)(a)(vii) Installation

Installation procedures must conform to the cable manufacturer's procedures for the specific cable being installed. Mechanical aids may be used, provided that a tension measuring device is placed in tension to the end of the cable, and the allowable tension does not exceed 500 lbf or the manufacturer's recommended pulling tension whichever is less. A calibrated break-away feature must be employed to work in tandem with the tension measuring device and limit excessive tension by disengaging when a set tension is exceeded.

When mechanical aids are proposed for use in pulling fiber optic cable, submit information on the proposed methods and the conditions for use. The submittal must conform to the information submittal requirements, including the time frames for review and approval, as described in "Air Blown Method," of the special provisions.

Except when the "Air Blown Method" is used, FO cable must be installed using a cable pulling lubricant recommended by the FO cable or the conduit manufacturer and a non-abrasive pull tape.

Splices must be limited to locations as shown on the plans and as directed by the Engineer.

During cable installation, the bend radius must be maintained at not less than twenty times the outside diameter of the cable. The stress relief component must be installed at the entrance to the FDU as recommended by the manufacturer. The cable grips for installing the fiber optic cable must have a ball bearing swivel to prevent the cable from twisting during installation. The final installed bend radius of the fiber optic cable must be no less than ten times the outside diameter of the cable.

FO cable must be installed without splices except where specifically allowed on the plans. If splice locations are not shown on the plans, splicing must be limited to one cable splice every 3.5 miles. Any midspan access splice or FDU termination must involve only those fibers being spliced as shown on the plans. Cable splices must be located in splice enclosures, installed in splice vaults shown on the plans. A minimum of 65 feet of slack must be specified for each F/O cable at each splice vault. A minimum of 50 feet of slack must be provided at each vault without a cable splice. Slack must be divided equally on each side of the F/O splice enclosure.

Only one FO cable must be installed in each conduit unless shown or provided otherwise.

86-2.08H(2)(a)(viii) Labeling

Label fiber optic cables in a permanent and consistent manner. Labels must be made of a material designed for permanent labeling. Labels must be mechanically marked with permanent ink on non-metal type labels, or embossed lettering on metal type labels; hand written labels must not be used. Metal tags must be constructed of stainless steel. Metal tags are required for use on fiber optic cables. Use of non-metal label materials must be only as approved by the Engineer. At vaults and other underground locations, all labels and imprinting must be weatherproof. Affix labels per the manufacturer's recommendations in a manner that will not cause damage to the cable or fiber.

86-2.08H(2)(a)(viii)(a) Cable Identification

Identification used for labeling of the fiber optic cables must be as shown on the plans.

86-2.08H(2)(a)(viii)(b) Label Placement

Fiber Optic Cables. - All cables must be labeled at all terminations, even if no connections or splices are made, and at fiber optic vault entrance and exit points (where splicing is required at the vault).

Cable to Cable Splices. - The cable must be labeled at entry to splice enclosure.

Cable to Fiber Distribution Units. - The cable must be labeled at entry to the FDU. Only one cable must be terminated in each FDU. The FDU must be labeled on the face of the FDU. Individual connections must be clearly marked on the face of the FDU in the designated area as directed by the Engineer.

Fibers. - Fiber labels must be placed next to the connectors of the individual fibers.

Jumpers. - Equipment to FDU Jumpers must be labeled as to the equipment type connected and must be labeled at both ends. FDU to FDU jumpers must be labeled with the cable ID-TYPE-START-END information at each end.

86-2.08H(2)(a)(viii) Fiber Optic Splicing

Unless otherwise allowed, FO cable splices must be fusion type. The mean splice loss must not exceed 0.07 dB per splice. The mean splice loss must be obtained by measuring the loss through the splice in both directions and then averaging the resultant values.

The field splices must connect the fibers of the two FO cable lengths together. These splices must be placed in a splice tray and these splice tray(s) must then be placed in the splice enclosure.

Fibers of the same buffer tube, but not being spliced must be placed in a splice tray alongside spliced fibers. Buffer tubes that do not require enclosed fibers to be spliced must not be disturbed and placed in the splice enclosure.

The termination splices must connect the FO cable span ends with pigtails. The termination splices must be placed in a splice tray and the splice tray(s) must then be placed in the fiber distribution unit (FDU). The individual fibers must be looped one full turn within the splice tray to avoid micro bending. A 2-inch minimum bend radius must be maintained during installation and after final assembly in the optical fiber splice tray. Each bare fiber must be individually restrained in a splice tray. The optical fibers in buffer tubes and the placement of the bare optical fibers in the splice tray must be such that there is no discernible tensile force on the optical fiber.

All splices must be protected with a metal reinforced thermal shrink sleeve.

All fiber optic cables must be labeled in the splice tray. Pigtail ends must also be labeled to identify the destination of the fiber.

86-2.08H(2)(b) Fiber Optic Splice Enclosure

The fiber optic field splices must be enclosed in splice enclosures which must be complete with splice organizer trays, brackets, clips, cable ties, and sealant, as needed. The splice enclosure must be suitable for a direct burial or pull box application. Manufacturer's installations must be supplied to the Engineer prior to the installation of any splice enclosures. Location of the splice enclosures must be where a splice is required as shown on the plans, designated by the Engineer, or described in the special provisions.

The splice enclosure must conform to the following specifications:

1. Non-filled thermoplastic case
2. Rodent proof, water proof, re-enterable and moisture proof
3. Expandable from 2 cables per end to 8 cables per end by using adapter plates
4. Cable entry ports must accommodate 0.40-inch to 1-inch diameter cables
5. Multiple grounding straps
6. Accommodate up to 8 splice trays
7. Suitable for "butt" or "through" cable entry configurations
8. Place no stress on finished splices within the splice trays

The size of the enclosure must allow all the fibers of the largest fiber optic cable to be spliced to a second cable of the same size, plus 12 additional pigtails. The enclosure must fit into the fiber optic splice vault and must leave sufficient space for routing of the fiber optic communication cables, without exceeding the minimum bending radius of any cable.

All materials in the enclosures must be nonreactive and must not support galvanic cell action.

Adequate splice trays must be specified to splice all fibers of the largest fiber optic cable, plus 12 pigtails.

The enclosure must be sealed using a procedure recommended by the manufacturer that will provide a waterproof environment for the splices. Encapsulant must be injected between the inner and outer enclosures.

Care must be taken at the cable entry points to ensure a tight salt resistant and waterproof seal is made which will not leak upon aging. It is acceptable to have multiple pigtails enter the fiber splice enclosure through one hole as long as all spaces between the cables are adequately sealed.

Bolt the splice enclosure to the side wall of the fiber optic vault.

The fiber optic splice enclosure must be suitable for a temperature range from 32 to 104°F.

Each splice must be individually mounted and mechanically protected in the splice tray.

You must install the fiber splice enclosure in the fiber optic vaults where splicing is required. The fiber optic splice enclosures must be securely fastened to the fiber optic vault or wall using standard hardware as recommended by the enclosure manufacturer.

You must provide all mounting hardware required to securely mount the enclosures.

86-2.08H(2)(c) Splice Tray

Splice trays must accommodate a minimum of 12 fusion splices and must allow for a minimum bend radius of 1.75 inch. Individual fibers must be looped one full turn within the splice tray to allow for future splicing. No stress is to be applied on the fiber when it is located in its final position. Buffer tubes must be secured near the entrance of the splice tray to reduce the chance of an inadvertent tug on the pigtail and damage to the fiber. The splice tray cover must be transparent.

Splice trays in the splice enclosure must conform to the following:

1. Accommodate up to 24 fusion splices
2. Place no stress on completed splices within the tray
3. Accommodate "butt" or "feed through" splicing applications.
4. Stackable with a transparent snap-on hinge cover
5. Buffer tubes securable with channel straps
6. Contain fiber retention strips.
7. Must be able to accommodate a fusion splice with the addition of an alternative splice holder
8. Must be labeled after splicing is completed.

Only one single splice tray may be secured by a bolt through the center of the tray in the fiber termination unit. Multiple trays must be securely held in place as per the manufacturer's recommendation.

86-2.08H(2)(d) Passive Cable Assemblies And Components

The F/O cable assemblies and components must be compatible components, designed for the purpose intended, and manufactured by a company regularly engaged in the production of material for the fiber optic industry. All components or assemblies must be best quality and non-corroding. All components or assemblies of the same type must be from the same manufacturer.

86-2.08H(3) Construction

86-2.08H(3)(a) Fiber Optic Cable Terminations

Fiber optic cable must continue within the conduit to the designated termination point for cable termination. All components must be the size and type required for the specified fiber. Fiber optic cable terminations may take place in several locations such as TOS cabinets and camera sites.

At the FDU, the cable jacket of the fiber optic cable, must be removed exposing the aramid yarn, filler rods, and buffer tubes. The exposed length of the buffer tubes must be at least the length recommended by the FDU manufacturer which allows the tubes to be secured to the splice trays. The remainder of the tubes must be removed to expose sufficient length of the fibers in order to properly install on the splice tray, as described in "Splicing," elsewhere in the special provisions

86-2.08H(4) Payment

Not Used

Replace 1st and 8th paragraphs of section 86-2.09E with:

Do not insulate splices by "Method B."

Add to section 86-2.11A:

Continuous welding of exterior seams in service equipment enclosures is not required.

Circuit breakers must be the cable-in/cable-out type mounted on non-energized clips. All circuit breakers must be mounted vertically with the up position of the handle being the "ON" position.

Each service must be provided with up to 2 main circuit breakers that will disconnect ungrounded service entrance conductors. Where the "Main" circuit breaker consists of 2 circuit breakers as described, each of the circuit breakers must have a minimum interrupting capacity of 10,000 A, rms.

Replace item 9 in the list in the 5th paragraph of section 86-2.11A with:

Circuit breakers used as service disconnect equipment must have a minimum interrupting capacity of 42,000 A, rms, for 120/240 V(ac) services and 30,000 A, rms, for 480 V(ac) services.

Replace 7th and 8th paragraphs of section 86-2.11A with:

Service equipment enclosures must be the aluminum type.

Replace "Reserved" in section 86-2.11B with:

Electric service (irrigation) must be from the service points to the irrigation controllers (IC) and to the spaces provided in the irrigation controller enclosure cabinets (CEC) for irrigation controllers as shown.

The inscription on the nameplates must be the letter designation used on the plans and in the special provisions.

Conductors, conduit, and pull boxes to the irrigation controller enclosure cabinets and irrigation controllers are included in the payment for electric service (irrigation).

Replace 1st paragraph of section 86-2.18 with:

Place numbers (with reflective sheet background) on the equipment as ordered. A typical material reference at an existing location in the field can be confirmed by the Engineer, or the typical materials can be made available for viewing.

Delete 2nd sentence of 3rd paragraph of section 86-2.18.

Add to the 4th paragraph of section 86-2.18:

On electroliers, the numbers shall be placed on the side nearest the roadway facing approaching traffic at a height up to 8 feet above the base plate.

Replace the 1st paragraph of section 86-3.02A(1) with:

This work includes installing a battery backup system. Comply with TEES.

Add to section 86-3.02A(3):

Batteries must have a written warranty against defects in materials and workmanship from the manufacturer prorated for a period of 60 months after installation. You must provide the Engineer with all warranty documentation before installation. Replacement batteries must be available within 5 business days after receipt of failed batteries. The Department pays to ship the failed batteries. Replacement batteries must be delivered to Caltrans at Caltrans District 11 Signal Laboratory, 7181 Opportunity Road, San Diego, CA 92111, telephone (858) 467-4010.

Add to section 86-3.02B:

External cabinet must be capable of housing:

1. 8 batteries
2. Inverter/charger unit
3. Power transfer relay
4. Manually-operated bypass switch
5. Required control panels
6. Wiring and harnesses

Replace "Reserved" in section 86-3.02D with:

The Department will assemble the BBS.

Payment for installing battery backup system is included in the payment for the traffic signal location involved.

Add to section 86-3.04:

Cabinet must be Model 334L and consist of a housing (B), a mounting cage 1, and the following listed equipment. The equipment must comply with chapter 6 of TEES.

1. Service panel no. 1
2. Power distribution assembly no. 3
3. Input file (I file)
4. C1 harness
5. Controller and equipment shelves
6. Dual fan assembly with thermostatic control
7. Mechanical armature-type relays
8. Input panel

Notify the Engineer when each 334L cabinet is ready for functional testing. Functional testing will be conducted by the Department.

Each power distribution assembly must include the following equipment:

1. Two duplex NEMA 5-15R controller receptacle (rear mount)
2. One 30 A, 1-pole, 120 V(ac) main circuit breaker
3. Three 15 A, 1-pole, 120 V(ac) circuit breaker
4. One duplex GFCI NEMA 15 A, receptacle (front mount)

Furnish 3 shelves as shown. Each shelf must be attached to the tops of 2 supporting angles with 4 screws. Supporting angles must extend from the front to the back rails. The front of the shelf must abut the front member of the mounting cage. Arrange shelves as shown. The angles must be designed to support a minimum of 50 pounds each. The horizontal side of each angle must be a minimum of 3 inches. The angles must be vertically adjustable.

Furnish 3 terminal blocks as shown. Terminal blocks must comply with Chapter 6 of TEES, except the screw size must be 8-32.

Furnish a maintenance manual or a combined maintenance and operation manual for all controller units, auxiliary equipment, vehicle detector sensor units, control units, and amplifiers. Submit manual when the controllers are delivered for testing or, if ordered by the Engineer, before purchasing. The manual must include the following:

1. Specifications
2. Design characteristics
3. General operation theory
4. Function of all controls
5. Troubleshooting procedure (diagnostic routine)
6. Block circuit diagram
7. Geographical layout of components
8. Schematic diagrams
9. List of replaceable component parts with stock numbers

Replace section 86-4.01D(1)(c)(ii) with:

86-4.01D(1)(c)(ii) Warranty

The manufacturer must provide a written warranty against defects in materials and workmanship for LED signal modules for a minimum period of 48 months after installation of LED signal modules. Replacement LED signal modules must be provided within 15 days after receipt of failed LED modules at your expense. The Department pays for shipping the failed modules to you. All warranty documentation must be submitted to the Engineer before installation. Replacement LED signal modules must be delivered to Caltrans District 11 Signal Laboratory, 7181 Opportunity Road, San Diego, CA 92111, telephone (858) 467-4010.

Add to section 86-4.01D(2)(a):

LED signal module must be manufactured for 12-inch circular and arrowsections.

Replace section 86-4.03I(1)(c)(ii) with:

86-4.03I(1)(c)(ii) Warranty

The manufacturer must provide a written warranty against defects in materials and workmanship for LED PSF modules for a minimum period of 48 months after installation of LED PSF modules. Replacement LED PSF modules must be provided within 15 days after receipt of failed LED PSF modules at your expense. The Department pays for shipping the failed modules to you. All warranty documentation must be submitted to the Engineer before installation. Replacement LED PSF modules must be delivered to Caltrans District 11 Signal Laboratory, 7181 Opportunity Road, San Diego, CA 92111, telephone (858) 467-4010.

Add to section 86-4.03I(2):

Installation of the LED PSF module into the pedestrian signal face only requires the removal of lenses, reflectors, lamps, and existing LED modules.

Add to section 86-5.01A(1):

Loop wire must be Type 2.

Loop detector lead-in cable must be Type B.

Slots must be filled with elastomeric sealant or hot-melt rubberized asphalt sealant.

For Type E detector loops, sides of the slot must be vertical and the minimum radius of the slot entering and leaving the circular part of the loop must be 1-1/2 inches. Slot width must be a maximum of 5/8 inch. Loop wire for circular loops must be Type 2. Slots of circular loops must be filled with elastomeric sealant or hot-melt rubberized asphalt sealant.

The depth of the loop sealant above the top of the uppermost loop wire in the sawed slots must be 2 inches, minimum.

Replace "Reserved" in section 86-5.01D with:

86-5.01D(1) General

Each traffic signal must have an emergency vehicle detector system that must comply with the details shown and the special provisions.

Each emergency vehicle detector system must consist of an optical emitter assembly or assemblies located on the appropriate vehicle and an optical detector/discriminator assembly or assemblies located at the traffic signal.

Emitter assemblies are not required for this project except units for testing purposes to demonstrate that the systems perform as specified. Tests must be conducted in the presence of the Engineer as described below under "System Operation" during the signal test period. The Engineer must be provided a minimum of 2 working days notice prior to performing the tests.

Each system must allow detection of 2 classes of authorized vehicles. Class I (mass transit) vehicles must be detected at ranges of up to 1,000 feet from the optical detector. Class II (emergency) vehicles must be detected at ranges up to 1,800 feet from the optical detector.

Class I signals (those emitted by Class I vehicles) must be distinguished from Class II signals (those emitted by Class II vehicles) on the basis of the modulation frequency of the light from the respective emitter. The modulation frequency for Class I signal emitters must be 9.639 Hz \pm 0.110 Hz. The modulation frequency for Class II signal emitters must be 14.035 Hz \pm 0.250 Hz.

A system must establish a priority of Class II vehicle signals over Class I vehicle signals and must comply with the requirements in section 25352 of the California Vehicle Code.

86-5.01D(2) Emitter Assembly

Each emitter assembly, provided for testing purposes, must consist of an emitter unit, an emitter control unit, and connecting cables.

86-5.01D(2)(a) General

Each emitter assembly, including lamp, must operate over an ambient temperature range of -34 to +60 degrees C at both modulation frequencies and operate continuously at the higher frequency for a minimum of 3,000 hours at 25 degrees C ambient before failure of the lamp or other components.

Each emitter unit must be controlled by a single, maintained-contact switch on the respective emitter control unit. The switch must be located to be readily accessible to the vehicle driver. The control unit

must contain a pilot light to indicate that the emitter power circuit is energized and must generate only 1 modulating code, either that for Class I vehicles or that for Class II vehicles.

86-5.01D(2)(b) Functional

Each emitter unit must transmit optical energy in 1 direction only.

The signal from each Class I signal emitter unit must be detectable at a distance of 1,000 feet when used with a standard optical detection/discriminator assembly and filter to eliminate visible light. Visible light must be considered eliminated when the output of the emitter unit with the filter is less than an average of 0.0003 candela per energy pulse in the wavelength range of 380 nm to 750 nm when measured at a distance of 10 feet. Submit a certificate of compliance for each Class I emitter unit.

The signal from each Class II signal emitter unit must be detectable at a distance of 1,800 feet when used with a standard optical detection/discriminator assembly.

The standard optical detection/discriminator assembly to be used in making the range tests must be available from the manufacturer of the system. A certified performance report must be furnished with each assembly.

86-5.01D(2)(c) Electrical

Each emitter assembly must provide full light output with input voltages of between 12.5 V (dc) and 17.5 V (dc). An emitter assembly must not be damaged by input voltages up to 7.5 V (dc) above supply voltage. The emitter assembly must not generate voltage transients, on the input supply, that exceed the supply voltage by more than 4 volts.

Each emitter assembly must consume not more than 100 W at 17.5 V (dc) and must have a power input circuit breaker rated at 10 A to 12 A, 12 V (dc).

The design and circuitry of each emitter must allow its use on vehicles with either negative or positive ground without disassembling or rewiring of the unit.

86-5.01D(2)(d) Mechanical

Each emitter unit must be housed in a weatherproof corrosion-resistant housing. The housing must be provided with facilities to allow mounting on various types of vehicles and must have provision for aligning the emitter unit properly and for locking the emitter unit into this alignment.

Each emitter control unit must be provided with hardware to allow the unit to be mounted in or on an emergency vehicle or mass transit vehicle. Where required for certain emergency vehicles, the emitter control unit and exposed controls must be weatherproof.

86-5.01D(3) Optical Detection/Discriminator Assembly

86-5.01D(3)(a) General

Each optical detection/discriminator assembly must consist of 1 or more optical detectors, connecting cable and a discriminator module.

Each assembly, when used with standard emitters, must have a range of at least 1,000 feet for Class I signals and 1,800 feet for Class II signals. Standard emitters for both classes of signals must be available from the manufacturer of the system. Range measurements must be taken with all range adjustments on the discriminator module set to "maximum".

86-5.01D(3)(b) Optical Detector

Each optical detector must be a waterproof unit capable of receiving optical energy from 2 separately aimable directions. The horizontal angle between the 2 directions must be variable from 180 degrees to 5 degrees.

The reception angle for each photocell assembly must be a maximum of 8 degrees in all directions about the aiming axis of the assembly. Measurements of reception angle will be taken at a range of 1,000 feet for a Type I emitter and at a range of 1,800 feet for a Type II emitter.

Internal circuitry must be solid state and electrical power must be provided by the associated discriminator module.

Each optical detector must be contained in a housing, which must include 2 rotatable photocell assemblies, an electronic assembly and a base. The base must have an opening to allow mounting on a mast arm or a vertical pipe nipple, or suspension from a span wire. The mounting opening must have female threads for 3/4 inch conduit. A cable entrance must be provided which must have male threads and gasketing to allow a waterproof cable connection. Each detector must have weight of less than 2.5 pounds and must present a maximum wind load area of 36 square inches. The housing must be provided with weep holes to allow drainage of condensed moisture.

Each optical detector must be installed, wired and aimed as specified by the manufacturer.

86-5.01D(3)(c) Cable

Optical detector cable (EV-C) must comply with the requirements of IPCEA-S-61-402/NEMA WC 5, section 7.4, 600-V (ac) control cable, 75 degrees C, Type B, and the following:

1. The cable must contain 3 conductors, each of which must be No. 20 (7 x 28) stranded, tinned copper with low-density polyethylene insulation. Minimum average insulation thickness must be 25 mils. Insulation of individual conductors must be color coded: 1-yellow, 1-blue, 1-orange.
2. The shield must be either tinned copper braid or aluminized polyester film with a nominal 20 percent overlap. Where film is used, a No. 20 (7 x 28) stranded, tinned, bare drain wire must be placed between the insulated conductors and the shield and in contact with the conductive surface of the shield.
3. The jacket must be black polyvinyl chloride with minimum ratings of 600 V (ac) and 80 degrees C and a minimum average thickness of 43 mils. The jacket must be marked as required by IPCEA/NEMA.
4. The finished outside diameter of the cable must not exceed 0.35-inch.
5. The capacitance, as measured between any conductor and the other conductors and the shield, must not exceed 48 pf per foot at 1000 Hz.
6. The cable run between each detector and the controller cabinet must be continuous without splices or must be spliced only as directed by the detector manufacturer.

86-5.01D(3)(d) Discriminator Module

Each discriminator module must be designed to be compatible and usable with a Model 170E controller unit and to be mounted in the input file of a Model 332L or Model 336L controller cabinet, and must comply with the requirements of chapter I of the State of California, Department of Transportation, "Traffic Signal Control Equipment Specifications."

Each discriminator module must be capable of operating 2 channels, each of which must provide an independent output for each separate input.

Each discriminator module, when used with its associated detectors, must perform the following:

1. Receive Class I signals at a range of up to 1,000 feet and Class II signals at a range of up to 1,800 feet.
2. Decode the signals, on the basis of frequency, at 9.639 Hz \pm 0.119 Hz for Class I signals and 14.035 Hz \pm 0.255 Hz for Class II signals.
3. Establish the validity of received signals on the basis of frequency and length of time received. A signal must be considered valid only when received for more than 0.50-second. No combination of Class I signals must be recognized as a Class II signal regardless of the number of signals being received, up to a maximum of 10 signals. Once a valid signal has been recognized, the effect must be held by the module in the event of temporary loss of the signal for a period adjustable from 4.5 seconds to 11 seconds in at least 2 steps at 5 seconds \pm 0.5 second and 10 seconds \pm 0.5 second.
4. Provide an output for each channel that will result in a "low" or grounded condition of the appropriate input of a Model 170E controller unit. For Class I signals the output must be a 6.25 Hz \pm 0.1 percent, rectangular waveform with a 50 percent duty cycle. For Class II signals the output must be steady.

Each discriminator module must receive electric power from the controller cabinet at either 24 V (dc) or 120 V (ac).

Each channel together with the channel's associated detectors must draw not more than 100 mA at 24 V (dc) or more than 100 mA at 120 V (ac). Electric power, 1 detector input for each channel and 1 output for each channel must terminate at the printed circuit board edge connector pins shown in the following table:

Board Edge Connector Pin Assignment

A	DC ground		
B	+24 V (dc)	P	(NC)
C	(NC)		
D	Detector input, Channel A	R	(NC)
E	+24V (dc) to detectors	S	(NC)
F	Channel A output (C)	T	(NC)
		U	(NC)
H	Channel A output (E)	V	(NC)
J	Detector input, Channel B	W	Channel B output (C)
K	DC ground to detectors	X	Channel B output (E)
L	Chassis ground	Y	(NC)
M	AC-	Z	(NC)
N	AC+		

(C) Collector, slotted for keying

(E) Emitter, slotted for keying

(NC) Not connected, cannot be used by manufacturer for any purpose.

Two auxiliary inputs for each channel must enter each module through the front panel connector. Pin assignment for the connector must be as follows:

1. Auxiliary detector 1 input, Channel A
2. Auxiliary detector 2 input, Channel A
3. Auxiliary detector 1 input, Channel B
4. Auxiliary detector 2 input, Channel B

Each channel output must be an optically isolated NPN open collector transistor capable of sinking 50 mA at 30 V (ac) and must be compatible with the Model 170E controller unit inputs.

Each discriminator module must be provided with means of preventing transients received by the detector from affecting the Model 170E controller assembly.

Each discriminator module must have a single connector board and must occupy 1 slot width of the input file. The front panel of each module must have a handle to facilitate withdrawal and the following controls and indicators for each channel:

1. Three separate range adjustments each for both Class I and Class II signals.
2. A 3-position, center-off, momentary contact switch, 1 position (down) labeled for test operation of Class I signals, and 1 position (up) labeled for test operation of Class II signals.
3. A "signal" indication and a "call" indication each for Class I and for Class II signals. The "signal" indication denotes that a signal above the threshold level has been received. A "call" indication denotes that a steady, validly coded signal has been received. These 2 indications may be accomplished with a single indication lamp; "signal" being denoted by a flashing indication and "call" with a steady indication.

In addition, the front panel must be provided with a single circular, bayonet-captured, multi-pin connector for 2 auxiliary detector inputs for each channel. Connector must be a mechanical configuration complying with the requirements in Military Specification MIL-C-26482 with 10-4 insert arrangement, such as Burndy Trim Trio Bantamate Series, consisting of the following:

1. Wall mounting receptacle, G0B10-4PNE with SM20M-1S6 gold plated pins.
2. Plug, G6L10-4SNE with SC20M-1S6 gold plated sockets, cable clamp and strain relief that must provide for a right angle turn within 2-1/2 inches maximum from the front panel surface of the discriminator module.

86-5.01D(3)(e) Cabinet Wiring

The Model 332L cabinet has provisions for connections between the optical detectors, the discriminator module and the Model 170E controller unit.

Wiring for a Model 332L cabinet must comply with the following:

1. Slots 12 and 13 of input file "J" have each been wired to accept a 2-channel module.
2. Field wiring for the primary detectors, except 24-V (dc) power, must terminate on either terminal board TB-9 in the controller cabinet or on the rear of input file "J," depending on cabinet configuration. Where TB-9 is used, position assignments must be as shown in the following table:

Position	Assignment
4	Channel A detector input, 1st module (Slot J-12)
5	Channel B detector input, 1st module (Slot J-12)
7	Channel A detector input, 2nd module (Slot J-13)
8	Channel B detector input, 2nd module (Slot J-13)

The 24-V (dc) cabinet power will be available at Position 1 of terminal board TB-1 in the controller cabinet.

Field wiring for the auxiliary detectors must terminate on terminal board TB-O in the controller cabinet. Position assignments are as shown in the following table:

For module 1 (J-12)		For module 2 (J-13)	
Position	Assignment	Position	Assignment
1	+24V (dc) from (J-12E)	7	+24V (dc) from (J-13E)
2	Detector ground From (J-12K)	8	Detector ground from (J-13K)
3	Channel A auxiliary detector input 1	9	Channel A auxiliary detector input 1
4	Channel A auxiliary detector input 2	10	Channel A auxiliary detector input 2
5	Channel B auxiliary detector input 1	11	Channel B auxiliary detector input 1
6	Channel B auxiliary detector input 2	12	Channel B auxiliary detector input 2

86-5.01D(4) System Operation

The Contractor must demonstrate that the components of each system are compatible and will perform satisfactorily as a system. Satisfactory performance must be determined using the following test procedure during the functional test period:

1. Each system to be used for testing must consist of an optical emitter assembly, an optical detector, an optical detector cable and a discriminator module.
2. The discriminator modules must be installed in the proper input file slot of the Model 170E controller assembly.
3. Two tests must be conducted; 1 using a Class I signal emitter and a distance of 1,000 feet between the emitter and the detector, the other using a Class II signal emitter and a distance of 1,800 feet between the emitter and the detector. Range adjustments on the module must be set to "Maximum" for each test.
4. Each test must be conducted for a period of 1 hour, during which the emitter must be operated for 30 cycles, each consisting of a 1 minute "on" interval and a 1 minute "off" interval. During the total test period the emitter signal must cause the proper response from the Model 170E controller unit during each "on" interval and there must be no improper operation of either the Model 170E controller unit or the monitor during each "off" interval.

86-5.01E Closed Circuit Television (CCTV) System

86-5.01E(1) General

Closed circuit television (CCTV) system consists of installing conduit, pull boxes, conductors, cable, telephone demarcation cabinet, Category 5E cable, CCTV camera assembly, CCTV pole, CCTV cabinet, serial to Ethernet conversion unit, and video encoder,, all as shown on the plans and specified in the special provisions.

86-5.01E(1)(a) Submittals

A minimum of 10 working days before the scheduled delivery of the closed circuit television camera assembly to the project site, submit:

1. A certificate of compliance certifying that the closed circuit television camera assembly complies with the requirements of the special provisions. The certificate must include a copy of all applicable test reports on the closed circuit television camera assembly.
2. Four sets of documentation containing complete specifications and operation details of each of the components of the CCTV camera assembly.
3. Four copies of the maintenance manuals for the pan and tilt unit.
4. Four sets of wiring diagrams showing wire colors, functions, and pin assignments for connecting these CCTV camera assembly components to each other and to the encoder.
5. Manufacturer's cut sheets or specifications data of CCTV camera cable assemblies, including connectors with strain relief backshells.
6. A copy of the CCTV camera cable assembly testing procedures and manufacturer's test results.

86-5.01E(2) Materials

86-5.01E(2)(a) Closed Circuit Television Camera Assembly

Prototype equipment will not be allowed. All equipment must be current standard production units.

The CCTV camera assembly must include these components:

1. Camera
2. Motorized zoom lens
3. Environmental enclosure with sun shield or shroud
4. Wiper
5. Pan and tilt unit

The CCTV camera assembly, including the pan and tilt unit must not exceed 8 inches wide x 18 inches high x 15 inches deep. Any external cables must not interfere with or limit the continuous pan and tilt operation.

The CCTV camera assembly must have all necessary wiring, cables, and connectors. All CCTV camera assemblies must be plug-compatible, interchangeable and suitable for use with the CCTV camera cable assembly described in the special provisions.

You must apply an approved weather-resistant spray to the inside of the connectors before engaging the connectors.

Closed circuit television camera assembly components must be rated for NEMA 4X, IP 66 or IP 67.

86-5.01E(2)(a)(i) Camera

86-5.01E(2)(a)(i)(1) Technical Requirements

All cameras supplied must meet the following:

Parameter	Specification
Optical Device	CCD, Color, interline transfer
Optical CCD Format Size	1/4 - inch format
Horizontal Resolution	460 television lines (minimum)
Sensitivity	1 lux at 1/60 s shutter speed (measured with f1.6 lens)
Scanning System	525 lines 2:1 interlace

The camera must be equipped with an electronic shutter with adjustable speeds ranging from 1/60 second to 1/30,000 second.

86-5.01E(2)(a)(i)(2) Electrical Requirements

All cameras supplied must meet the following:

Parameter	Specification
Operating Voltage	120 V(ac) \pm 10 percent (external adapter allowed)
Power Consumption	50 W (Maximum)
Video Output Signal	Standard NTSC color TV
Video Output Connector	Standard BNC bulkhead on rear of camera
Signal To Noise Ratio	>48 dB
Synchronization	Internal sync or phase adjustable line lock
Video Output Level	1.0 V p-p (75 Ω composite)
Gain Control	Automatic
Automatic Back Focus (Automatic White Balance)	Required

Programming must be stored non-volatile memory and the CCTV assembly firmware must be updateable via serial communication.

86-5.01E(2)(a)(i)(3) Environmental Requirements

All cameras supplied must meet the following:

Parameter	Specification
Operating Temperature	From 15 to 120°F
Storage Temperature	From -40 to 140°F
Operating Humidity	From 20 to 80 percent non-condensing
Storage Humidity	From 20 to 90 percent non-condensing

86-5.01E(2)(a)(ii) Motorized Zoom Lens**86-5.01E(2)(a)(ii)(1) General**

The lens must have motors for zoom, focus and iris.

The lens must have capability for focus and zoom preset positions. A telescopic converter or extender must not be used to achieve required focal length range.

86-5.01E(2)(a)(ii)(2) Technical and Functional Requirements

The lens must meet the following:

Parameter	Specification
Format	1/4-inch format
Iris	Motorized , with automatic and manual adjust modes
Operating temperature	From 15 to 120°F
Focal Length	Maximum not less than 3.15 inch (Optical power not less than 21X)
Lens Aperture	From F1.6 to F3.6
Horizontal angle of view at Maximum Focal Length	Not less than 2.2 degrees for 1/4-inch format camera

When the camera is pointed at a very bright object and or when the camera and lens is first turned on, the image produced by the lens and camera combination must not optically "oscillate" (i.e., produce an image that alternates from too light to too dark) or otherwise be unstable.

Each lens must have an automatic, motor-driven iris with manual override.

The lens must include mechanical or electrical means to protect the motors from over running in the extreme position.

The iris must be controlled directly through the camera in automatic mode and from any keyboard connected into the camera system in the manual mode. The automatic iris must provide continuous aperture adjustments of the lens as determined by the amount of light reaching the camera imager. The power supply and electronics for iris motor must be contained within the environmental housing.

When the power is removed from the lens, the lens iris must automatically close.

The motorized-iris cable must be strain relieved or sufficiently rugged such that the cable will not fail at the point where it leaves the lens assembly.

86-5.01E(2)(b) Environmental Enclosure

86-5.01E(2)(b)(i) General

The environmental enclosure must be the sealed, pressurized type, designed to withstand exposure to sand, dust, fungus, and salt atmosphere, and house the assembled camera, motorized zoom lens and all internal wiring.

It must operate on a voltage range of 120 V(ac) ±10 percent power source.

The enclosure must include an internal thermostatically controlled heater assembly to minimize external faceplate condensation.

The housing must have a wiper for wiping clean the external face of the housing window in front of the camera lens.

The enclosure must include a sun shield or shroud to provide protection from direct solar radiation.

You have the option of providing a sealed, pressurized Integrated Optics Cartridge (IOC) housed in a NEMA 4X rated enclosure.

The enclosure or IOC must be pressurized with 5 psi dry nitrogen. The enclosure must have a valve for pressurizing. In addition, a pressure relief valve with a 20 psi rating must be provided to protect the enclosure from overcharging. The notation "CAUTION - PRESSURIZED" must be printed on the enclosure. The letter height must be at least 1/4 inch.

86-5.01E(2)(b)(ii) Wiper

The wiper must have a wiper assembly, which includes blade and arm, and any mechanical, electrical or communication interfaces required to perform the function specified. The wiper must be designed to operate under damp or wet conditions, such as fog or rain, which leave external moisture on the housing window. The wiper assembly must be designed for general maintenance that can be performed in the field.

86-5.01E(2)(b)(iii) Technical and Functional Requirements

The housing must meet the following:

Parameter	Specification
Construction	All aluminum
Finish	White, light beige or gray that is either baked enamel or polyester powder coat
Weight	Less than 47 lb excluding heater
Camera Mounting	Platform mount with adjustment fore and aft

The camera lens must be positioned in the center of the housing window.

The housing unit must have lens preset capabilities.

The housing must not interfere with the widest viewing angle of the motorized zoom lens.

The camera enclosure must not incur any physical damage after a shock, return to normal operation immediately and operate within the specified vibration (see Note 1 below table).

Parameter	Specification
Shock	Up to 5 G while in non-operation mode
Vibration	From 5 Hz to 60 Hz with 0.083 inch total excursion, and 5 G rms vibration from 60 Hz to 1000 Hz.

Note 1: Where the manufacturer's cut sheet or specification data does not contain shock and vibration data a listing of at least 2 project sites with identical equipment, with similar installation conditions and similar traffic patterns showing continuous functional performance of at least 2 years may be substituted.

Any enclosure supplied must include a sun shield or shroud to protect the housing from the direct rays of the sun. The sun shroud must be made specifically for the model of enclosure that is selected.

86-5.01E(2)(c) Pan And Tilt Unit

86-5.01E(2)(c)(i) General

The pan and tilt unit must consist of the pan and tilt unit itself along with any electrical or communication interfaces required to perform the functions specified.

The pan and tilt unit must be designed to operate under a full range of environmental conditions. The pan and tilt unit with camera assembly mounted must withstand a wind load of 80 mph. The cable connector must be fully weather protected. External body components must be manufactured from aluminum that have been anodized, painted or coated to prevent oxidation and corrosion.

Access into the pan and tilt unit for routine maintenance or adjustments must not require removal of the pan and tilt from the installation site, nor removal of the camera enclosure from the pan and tilt unit. Access cover must be readily removable regardless of the tilt position.

86-5.01E(2)(c)(ii) Technical Requirements

The housing must meet the following:

Parameter	Specification
Pan and Tilt Worms	Ground and polished Stainless Steel
Pan and Tilt Worm Gears	Non-metallic material
Mounting (Base)	7 inch ± 0.013 inch diameter bolt circle Check Plans
Camera Mount	Compatible with camera housing
Bearings on Rotating Surfaces	Heavy duty roller type
Overload Protection	Provided - internal
Operating Temperature	From -10 to 140°F
Construction	Corrosion resistant steel or aluminum
Finish	Weather resistant paint or polyurethane
Seals	"O" ring or gaskets for all weather protection of pan and tilt unit and cables.

86-5.01E(2)(c)(iii) Functional Requirements

The housing must meet the following:

Parameter	Specification
Braking: Pan And Tilt	Mechanical or Electrical to limit coast
Overload Protection	Motors: Impedance protected
Angular Travel	Pan: From 0 to 355 degrees horizontal, Continuous Tilt: From +30 degrees up to -80 degrees down
Pan Speed	From 0.1 to 40 degrees/s variable-speed
Tilt Speed	From 0.1 to 20 degrees/s variable-speed
Pan And Tilt Position Preset	Positions camera to a predetermined azimuth, elevation and lens position (Minimum of 64 Presets)

86-5.01E(2)(c)(iv) Pan and Tilt Stops

The pan and tilt unit must have pan and tilt stops. The settings of these pan and tilt stops will be determined by the Engineer.

86-5.01E(2)(d) Software and Operational Requirements

The proposed camera protocol must be compatible with the existing system that uses Baxall's control which uses Pelco D protocol. The camera control protocol used by the camera assembly must be either an open public domain protocol, Pelco D, or other protocol convertible to Pelco D via translator. All functions described must be available using the described protocol. If a protocol other than Pelco D is proposed, you must provide a version of Baxall's camera control software "PC Control" or latest equivalent version that includes the new protocol as a choice for the new camera locations. The version of camera control software must not interfere with the operation of any other camera locations that use Pelco D. All camera control functions must be through the RS-422 communications interface.

Operator functions must be:

1. Pan Right
2. Pan Left
3. Tilt Up
4. Tilt Down
5. Zoom In
6. Zoom Out
7. Focus Near
8. Focus Far
9. Iris Open
10. Iris Close
11. Iris Manual
12. Iris Auto
13. Pan Stop
14. Tilt Stop
15. Zoom Stop
16. Focus Stop
17. Iris Stop

Administrative functions must be:

1. Status Query
2. Set Char. Display
3. Activate Char. Display
4. Blank Char. Display
5. Set Preset Position
6. Go to Preset Position
7. Set Relay
8. Reset Relay
9. Turn on Camera

10. Turn off Camera
11. Wiper on
12. Wiper off
13. Heater Control

86-5.01E(2(d)(i) Camera Control and Configuration

The existing system keyboard is a BAXALL Keyboard Part Number ZKX3-J. A copy of the keyboard manual is available for review upon request.

Pan and tilt position presets must be programmable via the system keyboard.

The system keyboard must control these operator basic functions:

1. Pan Left, Pan Right and Pan Stop controlled by Joystick.
2. Tilt Up, Tilt Down and Tilt Stop controlled by Joystick.
3. Zoom In, Zoom Out and Zoom Stop controlled by Zoom In and Zoom Out button.
4. Focus Near, Focus Far and Focus Stop controlled by Near Focus and Far Focus button.
5. Iris Open, Iris Close and Iris Stop controlled by Open Iris and Close Iris button.
6. Camera selections made by numeric keypad on system keyboard.
7. Monitor selections made by numeric keypad on system keyboard.

The stop actions for all Pan, Tilt, Zoom, Focus and Iris features will be issued once the Joystick, Zoom, Focus and Iris buttons are released.

The camera administrative functions must be accessible via system keyboard or by software installed on a personal computer. If the software method is used, the camera manufacturers menu system may be used.

86-5.01E(2)(e) Closed Circuit Television Camera Cable Assembly

86-5.01E(2)(e)(i) General

The closed circuit television (CCTV) camera cable assembly must conform to the details shown on the plans and the special provisions.

The interconnect wiring between the CCTV camera assembly and the camera encoder unit (CEU) must be a composite cable that includes flexible 75-ohm coaxial cable, AC power and control cable.

86-5.01E(2)(e)(i)(1) Submittals

Not used.

86-5.01E(2)(e)(ii) Technical Requirements

The camera cable assembly connector assignments for C1, C2 and C3 connectors are shown on the plans. C1, C2 and C3 connectors must be the connectors specified or equal. C1, C2, C3 and C4 connectors are also referred to as Conn 1, Conn 2, Conn 3 and Conn 4, respectively, on the plans.

For Connector 1, the connector type must be compatible, either directly or via adapter, with male AMP 206044-1 of existing field cameras.

The Connector C4 must conform to the following:

Connector C4 Assignment			
Pin	Function	Wire Color	Wire Gauge
Blade	Camera Power, AC Low	White	18 AWG
Blade	Camera Power, AC High	Black	18 AWG
Ground	Camera Power, Ground	Green	18 AWG

The CCTV camera cable assembly must conform to the following:

1. General

Overall Cable, Nom. weight/1,000 feet not to exceed:	291 lbs.
Overall Cable Minimum Bending Radius:	9 inches
All Materials, Temperature Rating, meet or exceed:	From -40 to +175°C
Overall Cable, Outside Diameter, not to exceed:	0.73 inches
Outside Jacket, Tinned Copper Braid Shield, minimum:	80 percent
Pulling tension, maximum:	500 lbs.
Overall Cable, Outside Jacket:	Black Thermoplastic Elastomer

2. Coax Cable

Coax Tinned Copper Braid Shield, minimum:	95 percent
Coax Insulation Material:	Solid Polyethylene
Coax Core Outside Diameter:	0.121 inch
Coax Outside Diameter:	0.178 inch
Coax Outside Jacket:	Cotton Braid

3. Single Cable - Shielded group of 3 No. 18 AWG and with a group of 4 No. 22 AWG inside cables. The individual conductors must be color coded with PVC insulation.
4. Drain wire must be provided for each group of cables.

86-5.01E(2)(e)(iii) Electrical Requirements

Coaxial Cable	
Nominal Impedance:	75 Ω
Nominal Capacitance:	70.54 pF/m
Nominal Velocity of Propagation:	66 percent
Nominal Delay:	5.05 ns/m
Attenuation	
at 1 MHz	0.0197 dB/m
at 5 MHz	0.0892 dB/m
at 10 MHz	0.0971 dB/m
at 50 MHz	0.1263 dB/m
at 100 MHz	0.1673 dB/m
Dielectric Strength:	
Nominal Shield DC Resistance at 20°C:	1900 V(rms)
Nominal Conductor DC Resistance at 20°C:	0.01378 Ω/m
Maximum Operating Voltage:	0.32808 Ω/m
	300 V (rms)

SHIELDED GROUP OF 3 No. 18 AWG CONDUCTORS	
Nominal Conductor DC Resistance at 20°C:	0.02133 Ω/m
Nominal Shield DC Resistance at 20°C:	0.03642 Ω/m
Nominal Capacitance (to Adj. conductors and Shield)	292 pF/m

SHIELDED GROUP OF 4 No. 22 AWG CONDUCTORS	
Nominal Conductor DC Resistance at 20°C:	0.05151 Ω/m
Nominal Shield DC Resistance at 20°C:	0.03675 Ω/m
Nominal Capacitance (to Adj. conductors and Shield)	230 pF/ m

86-5.01E(2)(e)(iv) Construction

Control cable must be routed from the CCTV camera assembly to the camera encoder and AC power inside the camera pole. Wiring must run continuous from source to destination without splices.

Cable slack of not less than 3 feet must be provided for equipment movement at pull boxes, vaults or cabinets. The cable must be secured and coiled neatly.

The cables and connectors must be installed to allow the camera and lens to be disconnected without removing the environmental camera housing.

Cable grip and J-hook must be as shown in the contract plans.

You are responsible for all testing and documentation required to establish approval and acceptance of the production, installation, and operation of these materials and equipment.

You must provide all materials necessary to make the connectors functional. All materials used to make the connectors must be compatible and must adhere to manufacturer's recommendations.

86-5.01E(2)(f) Closed Circuit Television Cabinet

Not used.

86-5.01E(2)(g) Fiber Distribution Unit

You must install all related equipment to interface the fiber distribution unit (FDU) to the incoming fiber optic communication cables.

The units must accommodate the fiber optic cable described in the special provisions.

Type A FDU must accommodate termination of not less than 144 individual fibers.

Type C FDU must accommodate termination of not less than 12 individual fibers.

The FDU must provide interconnect capability and must include the following:

1. A patch panel to terminate singlemode fiber with SC type connector feed through adapters.
2. Storage for splice trays.
3. A slide out metal shelf for the storage of 6 spare jumpers each measuring 36-inches long

The patch panel must be hinged to provide easy access and maintenance. Brackets must be provided to spool the incoming fiber a minimum of three turns, each turn of not less than 10 inches in length, before separating out individual fibers to the splice tray. Strain relief must be provided for the incoming fiber optic cable. All fibers must be terminated and identified in the FDU.

The FDU must be EIA 19-inch rack mountable.

86-5.01E(2)(h) Media Converter

Media converter must conform to the details shown on the plans and must be in conformance with the special provisions.

Media converter optical link range must be suitable for the operational distances shown on the plan sheets.

Media converter must have the following features:

Media Converter	
Feature	Parameter/Remarks
Ports	RJ-45,EIA/TIA 568A/B, Modular (10/100Base-TX) 100 Mbps duplex fiber port with SC-Type connector (singlemode required)
10/100Base-TX port	Automatically senses 10 Mbps or 100 Mbps connection speed, Auto-negotiates Half- or Full-Duplex mode, Auto-selects MDI/MDI-X media type
Fiber port	Half /Full-Duplex mode selector
Network media	100Base-TX and 100Base-FX: Singlemode fiber optic cable 8/125 μm or 9/125 μm, full-duplex to 20 km for SM Wavelength of 1310/1550nm
Serial Console Port	EIA 232
Protocol	SNMP manageable through SNMP-enabled networking management system via console or add-on module. SSL/SSH
Data Transfer Rate	100 Mbps (Half-Duplex), 200 Mbps (Full-Duplex)
Status LED indicators	power, copper link/activity, fiber optic link/activity, half/full duplex mode
Mounting	Standalone or Slot/Chassis Configuration as required
Power Supply	Supply voltage range 100 V(ac) to 135 V(ac) at 60 Hz. Standalone units: Internal power supply (maximum power consumption 6 W) or external power supply (maximum power consumption 14 W) Chassis units: only one power supply permitted
Power Adapter	Operating Temperature: From 0 to 35 °C Operating Humidity: Up to 85 percent (non-condensing)
Standards Compliance	IEEE 802.3i; 802.3u FCC: Class A or Class B, 10/100Base-TX, 100Base-FX
Warranty	Not less than 5 years for media and chassis (excludes power supplies, fans and lasers)

86-5.01E(2)(i) Media Converter Center

Media converter center must conform to the details shown on the plans and must be in conformance with the special provisions.

Media converter center optical link range must be suitable for the operational distances shown on the plan sheets.

Media converter center must have the following features:

Media Converter Center	
Feature	Parameter/Remarks
Ports	RJ-45,EIA/TIA 568A/B, Modular (10/100Base-TX) 100 Mbps duplex fiber port with SC-Type connector (singlemode required)
10/100Base-TX port	Automatically senses 10 Mbps or 100 Mbps connection speed, Auto-negotiates Half- or Full-Duplex mode, Auto-selects MDI/MDI-X media type
Fiber port	Half /Full-Duplex mode selector
Number of Fiber to Ethernet Conversion Ports	14 fiber to 14 Ethernet
Network media	100Base-TX and 100Base-FX: Singlemode fiber optic cable 8/125 μm or 9/125 μm, full-duplex to 20 km. for SM Wavelength of 1310/1550nm
Serial Console Port	EIA 232
Protocol	SNMP manageable through SNMP-enabled networking management system via console or add-on module. SSL/SSH
Data Transfer Rate	100 Mbps (Half-Duplex), 200 Mbps (Full-Duplex)
Status LED indicators	power, copper link/activity, fiber optic link/activity, half/full duplex mode
Mounting	Rack mounted or Slot/Chassis Configuration as required
Power Supply	Supply voltage range from 100 to 135 V(ac) at 60 Hz. Standalone units: Internal power supply (maximum power consumption 6 W) or external power supply (maximum power consumption 14 W) Chassis units: only one power supply permitted Operating Temperature: From 0 to 35 °C
Power Adapter	Operating Humidity: Up to 85 percent (non-condensing)
Standards Compliance	IEEE 802.3i;802.3u, FCC: Class A or Class B, 10/100Base-TX, 100Base-FX
Warranty	Not less than 5 years for media and chassis (excludes power supplies, fans and lasers)

86-5.01E(2)(j) Video Encoder

Video encoder must conform to the details shown on the plans and the special provisions.

Video encoder must have the following features:

Video Encoder	
Feature	Parameter/Remarks
Video Standard	SMPTE-170, 75 ohm
Video Input	75 ohm, BNC Connector
Video Compression	MPEG-4 Part 2 (ISO/IEC 14496-2) and Motion JPEG
Video Transmission	768kHz at 30fps
Network Interface	Auto sensing 10/100 BaseT port, IEEE 802.3
Protocol Support	TCP/IP, UDP/IP (unicast and multicast), Telnet
Frame Rate	Up to 30 fps at 2CIF
Serial Data Connector	DE-9
Serial Line Standard	Selectable between EIA-232, EIA-422, EIA-485
Serial Port Function	CCTV command and control
Serial Console Port	EIA-232
Encoder Software Updates	Via Serial port or network port
Encoder Configuration	Via Serial port or network port
Encoder Identification	IP addressable
Image quality and frame rate	configurable
Physical	1U height Rack Mountable, 12" Deep
Operating Temperature	From 41 to 120 degrees F
Operating Humidity	80 percent maximum relative humidity, non-condensing
Power Input	Power supply (24 V(dc) maximum) or 110 V(ac), 30 watts (maximum) consumption

86-5.01E(2)(k) Serial To Ethernet Conversion Unit

The serial to Ethernet conversion unit (SECU) must conform to the details shown on the plans and the special provisions.

The SECU must have the following features:

Serial to Ethernet Conversion Unit	
Feature	Parameter/Remarks
Support Protocols	ARP, UDP, TCP, Telnet, ICMP
Serial Device Support	Asynchronous, 7 or 8 bit with or without parity
Network Interface	Ethernet, 10/100BaseT
Network Connector	Modular
Serial Interface	EIA 232, DCE Configuration
Serial Interface Connector	170 Controller male 44-pin edge connector. The card edge connector must be fully compatible with the 170 Controller's modem card slot.
Data Rates	From 300 bps to 115 kbps, must transmit and receive 3600 bytes of serial data without interruption
Control Lines	RTS, CTS, DSR, DCD, DTR
Software Flow Control	XON, XOFF
Hardware Flow Control	CTS/RTS
Management	SNMP, Local console port log in, Telnet log in, Menu driven user selection and web based interface.
Console Port	EIA-232 with DE-9 Female connector
Indicators	Good Link, Network transmit/receive data, EIA-232, Transmit/Receive Data
Indicator Type	LED
Addressing	IP Addressable
Dimensions (nominal)	The unit must be a plug-in card for the 170 Controller. The form factor must conform to the mechanical requirements as shown in appendix A2-7, TEES, March 12, 2009
Operating Temperature	Must conform to TEES date 5/12/2009, Chapter 1, Section 1.8.4.
Power	12 V(dc), 3 watts maximum from the 170 Controller's edge connector
Warranty	Three Years

86-5.01E(3) Construction

86-5.01E(3)(a) Installation

You must make all the necessary adjustments on different components of the CCTV camera assembly. This includes the back-focus and tracking adjustments on the lens and color balancing of the camera.

You must ensure the back-focus adjustment on the camera is such that the lens focus is properly set and maintained when adjusting the focal length from zoom to wide angle. You must make this adjustment with the lens iris at full open position. This adjustment must be made such that when the zoom is adjusted from long range (telephoto) to wide angle, no refocusing is necessary.

The Engineer will notify you of the pan and tilt presets and stops for you to set prior to the CCTV camera assembly installation check. You must perform the installation check in the presence of the Engineer. At your option, the test of the operation (pan, tilt, zoom, iris and wiper) of the pan and tilt unit may be performed at the CCTV cabinet adjacent to the camera or by remote keyboard location. You must furnish a color video monitor, for testing only, to view the actual camera image. Upon completion of the installation check, the Engineer will verify operation of the pan and tilt unit. Any additional adjustments necessary to restore the presets and stops to acceptable parameters is at your expense.

86-5.01E(3)(b) Pre-Acceptance Testing

For each CCTV system location perform the specific quality control requirements for testing and documentation described in the special provisions. Notify the Engineer in writing fifteen days prior to the scheduled testing. All testing must be performed by you, at a mutually agreed time and place, and in the presence of the Engineer. Demonstrate all the features of the CCTV system. Provide the necessary equipment required to access the CCTV equipment for testing. The Engineer will use the results from the pre-acceptance testing, and may discuss with the on-site technician, to determine settings used in final testing and documentation of the CCTV system.

86-5.01E(3)(c) Testing and Documentation

You are responsible for all testing and documentation required for approval and acceptance of the production, installation, and operation of these materials and equipment. The following identifies the specific quality control requirements for testing and documentation:

1. Test all cables, after installation with connectors attached, for continuity and shorts or grounds.
2. Adjust and set limit stops to the pan and tilt unit at each camera site to prevent the view of the areas outside of the roadway system. The final settings will be approved by the Engineer.
3. Perform a local functional test at each of the CCTV locations. At your option, the test may be performed directly at the CCTV cabinet or remotely via keyboard or keyboard and personal computer. Verify all the CCTV features. You must provide all test equipment.
4. Arrange to have a technician, qualified to work on the closed circuit television assembly and employed by the closed circuit television assembly manufacturer or the manufacturer's representative, present at the time the equipment is turned on.

86-5.01E(4) Payment

Not used.

Add to section 86-5.01:

86-5.01F VIDEO IMAGE VEHICLE DETECTION SYSTEM

86-5.01F(1) General

86-5.01F(1)(a) Summary

This work includes installing video image vehicle detection system (VIVDS) for traffic signals.

86-5.01F(1)(b) Definitions

Video Detection Unit (VDU): Processor unit that converts the video image from the camera and provides vehicle detection in defined zones. Unit includes an image processor, extension module, and communication card.

Video Image Sensor Assembly (VIS): An enclosed and environmentally-protected camera assembly used to collect the video image.

Video Image Vehicle Detection System (VIVDS): A system that detects video images of vehicles in defined zones and provides video output.

86-5.01F(1)(c) Submittals

Submit documentation within 30 days after Contract approval but before installing VIVDS equipment.

The documentation submittal must include:

1. Certificate of Compliance: s specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.
2. Site Analysis Report: Written analysis for each detection site, recommending the optimum video sensor placement approved by the manufacturer.
3. Lane Configuration: Shop drawing showing:
 - 3.1. Detection zone setback
 - 3.2. Detection zone size
 - 3.3. Camera elevation
 - 3.4. Selected lens viewing angle

- 3.5. Illustration of detection zone mapping to reporting contact output
- 3.6. Illustration of output connector pin or wire terminal for lane assignment.
4. Configuration Record: Windows XP PC compatible CD containing:
 - 4.1. Proposed zone designs
 - 4.2. Calibration settings
5. Mounting and Wiring Information: Manufacturer approved wiring and service connection diagrams.
6. Communication Protocol: Industry standard available in public domain. Document defining:
 - 6.1. Message structure organization
 - 6.2. Data packet length
 - 6.3. Message usability
 - 6.4. Necessary information to operate a system from a remote windows based personal computer.
7. Programming Software: CD containing set up and calibration software that observes and detects the vehicular traffic, including bicycles, motorcycles, and sub-compact cars, with overlay of detection zones and allows adjustment of the detection sensitivity for a traffic signal application.
8. Detector Performance DVD Recordings and Analysis: Performance analysis based on 24-hour DVD recording of contiguous activity for each approach. Include:
 - 8.1. Two contiguous hours of sunny condition, with visible shadows projected a minimum of 6 feet into the adjacent lanes
 - 8.2. Two 1-hour night periods with vehicle headlights present.
9. Preventative Maintenance Parts Documentation: List of equipment replacement parts for preventative maintenance, including:
 - 9.1. Electrical parts
 - 9.2. Mechanical parts
 - 9.3. Assemblies.

Allow 7 days for the Engineer to review the documentation submittal.

If the Engineer requires revisions, submit a revised submittal within 5 days of receipt of the Engineer's comments and allow 5 days for the Engineer to review. If agreed to by the Engineer, revisions may be included as attachments in the resubmittal. The Engineer may conditionally approve, in writing, resubmittals that include revisions submitted as attachments, in order to allow construction activities to proceed.

Upon the Engineer's approval of the resubmittal, submit copies of the final documents (with approved revisions incorporated) to the Engineer.

Submit an acceptance testing schedule for approval 15 days before starting acceptance testing.

When beginning acceptance testing of VIVDS, submit the following:

1. Configuration Record: Windows XP PC compatible CD containing:
 - 1.1. Final zone designs
 - 1.2. Calibration settings to allow reinstallation.
2. Mounting and Wiring Information: Final wiring and service connection diagrams wrapped in clear self-adhesive plastic, placed in a heavy duty plastic envelope, and secured to the inside of the cabinet door.

86-5.01F(1)(d) Quality Control and Assurance

86-5.01F(1)(d)(1) General

VIVDS and support equipment required for acceptance testing must be new and as specified in the manufacturer's recommendations. Date of manufacture, as shown by date codes or serial numbers of electronic circuit assemblies, must not be older than 12 months from the scheduled installation start date. Material substitutions must not deviate from the material list approved by the Engineer.

86-5.01F(1)(d)(1)(a) Training

86-5.01F(1)(d)(1)(b) Warranty

Provide a manufacturer's written warranty against defects in materials and workmanship for VIS and VDU units. The warranty must be valid for a period extending at least 36 months beyond the date of successful completion of acceptance testing. All warranty documentation must be given to the Engineer prior to installation.

After final acceptance of VIVDS, replacement VIS and VDU must be provided within 10 days of receipt of a failed unit at no cost to the Department, except the two way shipping charges for VIS and VDU that will be paid by the Department district office that owns the equipment. Deliver replacement VIS and VDU to the Caltrans District 11 Signal Laboratory, 7181 Opportunity Road, San Diego, CA 92111.

86-5.01F(2) Materials

86-5.01F(2)(a) General

VIVDS must include necessary firmware, hardware, and software for designing the detection patterns or zones at the intersection or approach. Detection zones must be created with a graphic user interface designed to allow to anyone trained in VIVDS system setup to configure and calibrate a lane in less than 15 minutes.

System elements must comply with the manufacturer's recommendations and be designed to operate continuously in an outdoor environment.

All equipment, cables, and hardware must be part of an engineered system that is designed by the manufacturer to fully interoperate with all other system components. Mounting assemblies must be corrosion resistant. Connectors installed outside the cabinets and enclosures must be corrosion resistant, weather proof, and watertight. Exposed cables must be sunlight and weather resistant.

86-5.01F(2)(a)(1) Physical and Mechanical Requirements

VIVDS must include:

1. VIS and mounting hardware. Use a clamping device as mounting hardware on a pole or mast-arm.
2. VDU
3. Power supply
4. Surge suppression
5. Cables
6. Connectors
7. Wiring for connecting to the Department-furnished Model 332L traffic controller cabinet.
8. Communication card

86-5.01F(2)(a)(2) Electrical

VIVDS must operate between 90 to 135 V(ac) service as specified in NEMA TS-1. VIS, excluding the heater circuit, must draw less than 10 W of power. Power supply or transformer for the VIVDS must meet the following minimum requirements:

Minimum Requirements for Power Supply and Transformers

Item	Power Supply	Transformer
Power Cord	Standard 120 V(ac), 3 prong cord, 3 feet minimum length (may be added by Contractor)	Standard 120 V(ac), 3 prong cord, 3 feet minimum length (may be added by Contractor)
Type	Switching mode type	Class 2
Rated Power	Two times (2x) full system load	Two times (2x) full system load
Operating Temperature	From -37 to 74 °C	From -37 to 74 °C
Operating Humidity Range	From 5 to 95 percent	From 5 to 95 percent
Input Voltage	From 90 to 135 V(ac)	From 90 to 135 V(ac)
Input Frequency	60 ± 3 Hz	60 ± 3 Hz
Inrush Current	Cold start, 25 A Max. at 115 V(ac)	N/A
Output Voltage	As required by VIVDS	As required by VIVDS
Overload Protection	From 105 to 150 percent in output pulsing mode	Power limited at >150 percent
Over Voltage Protection	From 115 to 135 percent of rated output voltage	N/A
Setup, Rise, Hold Up	800ms, 50ms, 15ms at 115 V(ac)	N/A
Withstand Voltage	I/P-0/P:3kV, I/P-FG:1.5kV, for 60 s.	I/P-0/P:3kV, I/P-FG:1.5kV, for 60 s
Working Temperature	Not to exceed 70°C at 30 percent load	Not to exceed 70 °C at 30 percent load
Safety Standards	UL 1012, UL 60950	UL 1585
EMC Standards	EN55022 Class B, EN61000-4-2, 3, 4, 5	N/A

Field terminated circuits must include transient protection as specified in IEEE Standard 587-1980, Category C. Video connections must be isolated from ground.

86-5.01F(2)(a)(3) Technical Requirements

Camera and zoom lens assembly must be housed in an environmentally sealed enclosure that complies with NEMA 4 standards. Enclosure must be watertight and protected from dust. Enclosure must include a thermostat controlled heater to prevent condensation and to ensure proper lens operation at low temperatures. Adjustable sun shield that diverts water from the camera's field of view must be included. Connectors, cables and wiring must be enclosed and protected from weather. An environmentally sealed (protected from dust and moisture ingress) connector must be used at the rear plate of the housing. Wiring to the connector must be sealed with silicone or putty compound.

Each camera and its mounting hardware must be less than 10 pounds and less than 1 square foot equivalent pressure area. Only one camera must be mounted on a traffic signal or luminaire arm. Top of camera must not be more than 12 inches above top of luminaire arm or 30 inches above top of traffic signal arm.

VIS must use a charge-coupled device (CCD) element, support National Television Standards Committee (NTSC) and RS170 video output formats, and have a horizontal resolution of at least 360 lines. VIS must include an auto gain control (AGC) circuit, have a minimum sensitivity to scene luminance from 0.01 to 930 foot-candle, and produce a usable video image of vehicular traffic under all roadway lighting conditions regardless of the time of day. VIS must have a motorized lens with variable focus and zoom control with an aperture of f/1.4 or better. Focal length must allow ± 50 percent adjustment of the viewed detection scene.

A flat panel video display with a minimum 8-inch screen and that supports NTSC video output must be enclosed in the Model 332L cabinet for viewing video detector images and for performing diagnostic testing. Display must be viewable in direct sunlight. Each VIVDS must have video system connections that support the NTSC video output format, can be seen in each camera's field of view, and has a program to allow the user to switch to any video signal at an intersection. A metal shelf or pull-out document tray with metal top capable of supporting the VDU and monitor must be furnished and placed on an EIA 19 inch rack with 10-32 "Universal Spacing" threaded holes in the Model 332L cabinet. System must allow independent viewing of a scene while video recording other scenes without interfering with the operation of the system's output.

Mounting hardware must be powder-coated aluminum, stainless steel, or treated to withstand 250 hours of salt fog exposure as specified in ASTM B 117 without any visible corrosion damage.

VDU must operate between -37 to $+74$ °C and from 0 to 95 percent relative humidity.

VDU front panel must have indicators for power, communication, presence of video input for each VIS, and a real time detector output operation. Hardware or software test switch must be included to allow the user to place either a constant or momentary call for each approach. Indicators must be visible in daylight from 5 feet away.

VDU must have a serial communication port, EIA 232/USB 2.0 that supports sensor unit setup, diagnostics, and operation from a local PC compatible laptop with Windows XP or later version operating system. VIVDS must have an Ethernet communication environment, including Ethernet communication card. VIVDS must include central and field software to support remote real-time viewing and diagnostics for operational capabilities through wide area network (WAN).

VDU, image processors, extension modules, and video output assemblies must be inserted into the controller input file slots using the edge connector to obtain limited 24 V(dc) power and to provide contact closure outputs. Cabling the output file to a "D" connector on the front of the VDU is acceptable. No rewiring to the standard Model 332L cabinet is allowed. Controller cabinet resident modules must comply with the requirements in Chapter 1 and Sections 5.2.8, 5.2.8.1, 5.2.8.2, 5.4.1, 5.4.5, 5.5.1, 5.5.5, and 5.5.6 of TEES.

86-5.01F(2)(a)(4) Functional Requirements

VIVDS must support normal operation of existing detection zones while a zone is being added or modified. Zone must flash or change color on a viewing monitor when vehicular traffic is detected. Length and width of each detection zone for each lane must be approved by the Engineer.

Software and firmware must detect vehicular traffic presence, provide vehicle counts, set up detection zones, test VIVDS performance, and allow video scene and system operation viewing from the local traffic management center/office. VIVDS must support a minimum of 2 separate detection patterns or zones that can be enacted by a remote operator at the signal controller cabinet.

VIVDS detection zone must detect vehicles by providing an output for presence and pulse. At least one detection output must be provided for each detection zone. One spare detection output must be provided for each approach. Detection performance must be achieved for each detection zone with a maximum of 8 user-defined zones for every camera's field of view.

VIVDS must detect the presence of vehicles under all types of adverse weather and environmental conditions, including snow, hail, fog, dirt, dust or contaminant buildup on the lens or faceplate, minor camera motion due to winds, and vibration. Under low visibility conditions, the VIVDS must respond by selecting a fail-safe default pattern, placing a constant call mode for all approaches. VIVDS outputs must assume a fail-safe "on" or "call" pattern for presence detection if video signal or power is not available and must recover from a power failure by restoring normal operations within 3 minutes without manual intervention. If powered off for more than 90 days, system must maintain the configuration and calibration information in memory.

Detection algorithm must be designed to accommodate naturally occurring lighting and environment changes, specifically the slow moving shadows cast by buildings, trees, and other objects. These changes must not result in a false detection or mask a true detection. VIVDS must not require manual interventions for day-night transition or for reflections from poles, vehicles or pavement during rain and

weather changes. VIVDS must suppress blooming effects from vehicle headlights and bright objects at night.

Vehicle detection must call service to a phase only if a demand exists and extend green service to the phase until the demand is taken care of or until the flow rates have reduced to levels for phase termination. VIVDS must detect the presence of vehicular traffic at the detection zone positions and provide the call contact outputs to the Model 170E or Model 2070 controller assembly with the following performance:

Detector Performance		
Requirements	Performance during AMBER and RED interval	Performance during GREEN interval
Average response time after vehicle enters 3 feet into detection zone or after exiting 3 feet past detection zone	≤ 1 s	≤ 100 ms
Maximum number of MISSED CALLS in 24-hour duration, where MISSED CALLS are greater than 5 s during AMBER and RED intervals and greater than 1 s during GREEN intervals (upon entering 3 feet of detection zone or after exiting 3 feet past detection zone).	0	10
Maximum number of FALSE CALLS in 24-hour duration (calls greater than 500ms without a vehicle present)	20	20

VIVDS must be able to locally store, for each lane, vehicle count data in 5, 15, 30, and 60 minute intervals for a minimum period of 7 days and be remotely retrievable. VIVDS must count vehicular traffic in detection zone with a 95 percent accuracy or better for every hour counted over a morning or an evening peak hour. VIVDS detection zone tested must have a minimum range of 50 feet behind the limit line for each approach. Testing period will be pre-approved by the Engineer 48 hours in advance.

86-5.01F(3) Construction

Install VDU in a Department-furnished Model 170E or Model 2070 controller assembly. Install VIS power supply or transformer on a standard DIN rail using standard mounting hardware and power conductors wired to DIN rail mounted terminal blocks in the controller cabinet.

Wiring must be routed through end caps or existing holes. New holes for mounting or wiring must be shop-drilled.

Wire each VIS to the controller cabinet with a wiring harness that includes all power, control wiring, and coaxial video cable. Attach harness with standard MIL type and rated plugs. Cable type and wire characteristics must comply with manufacturer's recommendations for the VIS to cabinet distance. Wiring and cables must be continuous, without splices, between the VIS and controller cabinet. Coil a minimum of 7 feet of slack in the bottom of the controller cabinet. For setup and diagnostic access, terminate serial data communication output conductors at TB-0 and continue for a minimum of 10 feet to a DB9F connector. Tape ends of unused and spare conductors to prevent accidental contact to other circuits.

Label conductors inside the cabinet for the functions depicted the approved detailed diagrams. Label cables with permanent cable labels at each end.

Adjust the lens to view 110 percent of the largest detection area dimension. Zones or elements must be logically combined into reporting contact outputs that are equivalent to the detection loops and with the detection accuracy required.

Verify the performance of each unit, individually, and submit the recorded average and necessary material at the conclusion of the performance test. Determine and document the accuracy of each unit, individually, so that each unit may be approved or rejected separately. Failure to submit necessary material at the conclusion of testing invalidates the test. The recorded media serves as acceptance evidence and must not be used for calibration. Calibration must have been completed before testing and verification.

Verify the detection accuracy by observing the VIVDS performance and recorded video images for a contiguous 24-hour period. The recorded video images must show the viewed detection scene, the detector call operation, the signal phase status for each approach, the vehicular traffic count, and time-stamp to 1/100 of a second, all overlaid on the recorded video. Transfer the 24-hour analysis to DVD.

VIVDS must meet the detection acceptance criterion specified in table titled "Detector Performance."

Calculate the VIVDS's vehicular traffic count accuracy as $100[1-(|TC-DC|/TC)]$, where DC is the detector's vehicular traffic count and TC is the observed media-recorded vehicular traffic count and where the resulting fraction is expressed as an absolute value.

The Engineer will review the data findings and accept or reject the results within 7 days. Vehicle anomalies or unusual occurrences will be decided by the Engineer. Data or counts not agreed by the Engineer will be considered errors and count against the unit's calibration. If the Engineer determines that the VIVDS does not meet the performance requirements, you must re-calibrate and retest the unit, and resubmit new test data within 7 days. After 3 failed attempts, you must replace the VIVDS with a new unit.

Notify the Engineer 20 days before the unit is ready for acceptance testing. Acceptance testing must be scheduled to be completed before the end of a normal work shift. You must demonstrate that all VIS and VDUs satisfy the functional requirements.

86-5.01F(4) Payment

Repair, replacement, and retesting of VIVDS components due to failure or rejection are at your expense.

Replace section 86-6.01 with:

86-6.01 LED LUMINAIRES

86-6.01A General

86-6.01A(1) Summary

Section 86-6.01 includes specifications for installing LED luminaires.

86-6.01A(2) Definitions

CALiPER: Commercially Available LED Product Evaluation and Reporting. A U.S. DOE program that individually tests and provides unbiased information on the performance of commercially available LED luminaires and lights.

correlated color temperature: Absolute temperature in kelvin of a blackbody whose chromaticity most nearly resembles that of the light source.

house side lumens: Lumens from a luminaire directed to light up areas between the fixture and the pole (e.g., sidewalks at intersection or areas off of the shoulders on freeways).

International Electrotechnical Commission (IEC): Organization that prepares and publishes international standards for all electrical, electronic and related technologies.

junction temperature: Temperature of the electronic junction of the LED device. The junction temperature is critical in determining photometric performance, estimating operational life, and preventing catastrophic failure of the LED.

L70: Extrapolated life in hours of the luminaire when the luminous output depreciates 30 percent from initial values.

LM-79: Test method from the Illumination Engineering Society of North America (IESNA) specifying test conditions, measurements, and report format for testing solid state lighting devices, including LED luminaires.

LM-80: Test method from the IESNA specifying test conditions, measurements, and report format for testing and estimating the long term performance of LEDs for general lighting purposes.

National Voluntary Laboratory Accreditation Program (NVLAP): U.S. DOE program that accredits independent testing laboratories to qualify.

power factor: Ratio of the real power component to the complex power component.

street side lumens: Lumens from a luminaire directed to light up areas between the fixture and the roadway (e.g., traveled ways, freeway lanes).

surge protection device (SPD): Subsystem or component that can protect the unit against short duration voltage and current surges.

total harmonic distortion: Ratio of the rms value of the sum of the squared individual harmonic amplitudes to the rms value of the fundamental frequency of a complex waveform.

86-6.01A(3) Submittals

Submit a sample luminaire to METS for testing after the manufacturer's testing is completed. Include the manufacturer's testing data.

Product submittals must include:

1. LED luminaire checklist.
2. Product specification sheets, including:
 - 2.1. Maximum power in watts.
 - 2.2. Maximum designed junction temperature.
 - 2.3. Heat sink area in square inches.
 - 2.4. Designed junction to ambient thermal resistance calculation with thermal resistance components clearly defined.
 - 2.5. L70 in hours when extrapolated for the average nighttime operating temperature.
3. IES LM-79 and IES LM-80 compliant test reports from a CALiPER-qualified or NVLAP-approved testing laboratory for the specific model submitted.
4. Photometric file based on LM-79 test report.
5. Initial and depreciated isofootcandle diagrams showing the specified minimum illuminance for the particular application. The diagrams must be calibrated to feet and show a 40 by 40 foot grid. The diagrams must be calibrated to the mounting height specified for that particular application. The depreciated isofootcandle diagrams must be calculated at the minimum operational life.
6. Test report showing SPD performance as tested under ANSI/IEEE C62.41.2 and ANSI/IEEE C62.45.
7. Test report showing mechanical vibration test results as tested under California Test 611 or equal.
8. Data sheets from the LED manufacturer that include information on life expectancy based on junction temperature.
9. Data sheets from the power supply manufacturer that include life expectancy information.

Submit documentation of a production QA performed by the luminaire manufacturer that ensures the minimum performance levels of the modules comply with the section 86-6.01 specifications and includes a documented process for resolving problems. Submit documentation as an informational submittal.

Submit warranty documentation as an informational submittal before installing LED luminaires.

86-6.01A(4) Quality Control and Assurance

86-6.01A(4)(a) General

The Department may perform random sample testing on the shipments. The Department completes testing within 30 days after delivery to METS. Luminaires are tested under California Test 678. All parameters specified in section 86-6.01 specifications may be tested on the shipment sample. When testing is complete, the Department notifies you. Pick up the equipment from the test site and deliver to the job site.

One sample luminaire must be fitted with a thermistor or thermo-couple temperature sensor. A temperature sensor must be mounted on the LED solder pad as close to the LED as possible. A temperature sensor must be mounted on the power supply case. Light bar or modular systems must have 1 sensor for each module mounted as close to the center of the module as possible. Other configurations must have at least 5 sensors per luminaire. Contact METS for advice on sensor location. Thermocouples must be either Type K or C. Thermistors must be a negative temperature coefficient type with a nominal resistance of 20 kΩ. The appropriate thermocouple wire must be used. The leads must be a minimum of 6 feet. Documentation must accompany the test unit that details the type of sensor used.

The sample luminaires must be energized for a minimum of 24 hours, at 100 percent on-time duty cycle, at a temperature of +70 degrees F before performing any testing.

The luminaire lighting performance must be depreciated for the minimum operating life by using the LED manufacturer's data or the data from the LM-80 test report, whichever results in a higher lumen depreciation.

Failure of the luminaire that renders the unit noncompliant with section 86-6.01 specifications is cause for rejection. If a unit is rejected, allow 30 days for retesting. The retesting period starts when the replacement luminaire is delivered to the test site.

If a luminaire submitted for testing does not comply with section 86-6.01, remove the unit from METS within 5 business days after notification the unit is rejected. If the unit is not removed within that period, the Department may ship the unit to you and deduct the cost.

86-6.01A(4)(b) Warranty

Furnish a 7-year replacement warranty from the manufacturer of the luminaires against any defects or failures. The effective date of the warranty is the date of installation. Furnish replacement luminaires within 10 days after receipt of the failed luminaire. The Department does not pay for the replacement. Deliver replacement luminaires to the following department electrical shop:

Caltrans District 11 Signal Laboratory
 7181 Opportunity Road
 San Diego, CA 92111
 Telephone (858) 467-4010

86-6.01B Materials

86-6.01B(1) General

The luminaire must include an assembly that uses LEDs as the light source. The assembly must include a housing, an LED array, and an electronic driver. The luminaire must:

1. Be UL listed under UL 1598 for luminaires in wet locations or an equivalent standard from a recognized testing laboratory
2. Have a minimum operational life of 63,000 hours
3. Operate at an average operating time of 11.5 hours per night
4. Be designed to operate at an average nighttime operating temperature of 70 degrees F
5. Have an operating temperature range from -40 to +130 degrees F
6. Be defined by the following application:

Application	Replaces
Roadway 1	200 Watt HPS mounted at 34 ft
Roadway 2	310 Watt HPS mounted at 40 ft
Roadway 3	310 Watt HPS mounted at 40 ft with back side control
Roadway 4	400 Watt HPS mounted at 40 ft

The individual LEDs must be connected such that a catastrophic loss or a failure of 1 LED does not result in the loss of more than 20 percent of the luminous output of the luminaire.

86-6.01B(2) Luminaire Identification

Each luminaire must have the following identification permanently marked inside the unit and outside of its packaging box:

1. Manufacturer's name
2. Trademark
3. Model no.
4. Serial no.
5. Date of manufacture (month-year)
6. Lot number
7. Contract number
8. Rated voltage
9. Rated wattage
10. Rated power in VA

86-6.01B(3) Electrical Requirements

The luminaire must operate from a 60 ± 3 Hz AC power source. The fluctuations of line voltage must have no visible effect on the luminous output. The operating voltage may range from 120 to 480 V(ac). The luminaire must operate over the entire voltage range or the voltage range must be selected from either of the following options:

1. Luminaire must operate over a voltage range of 95 to 277 V(ac). The operating voltages for this option are 120 V(ac) and 240 V(ac).
2. Luminaire must operate over a voltage range of 347 to 480 V(ac). The operating voltage for this option is 480 V(ac).

The power factor of the luminaire must be 0.90 or greater. The total harmonic distortion, current and voltage, induced into an AC power line by a luminaire must not exceed 20 percent. The maximum power consumption allowed for the luminaire must be as shown in the following table:

Application	Maximum consumption (Watts)
Roadway 1	165
Roadway 2	235
Roadway 3	235
Roadway 4	300

86-6.01B(4) Surge Suppression and Electromagnetic Interference

The luminaire on-board circuitry must include an SPD to withstand high repetition noise transients caused by utility line switching, nearby lightning strikes, and other interferences. The SPD must protect the luminaire from damage and failure due to transient voltages and currents as defined in Tables 1 and 4 of ANSI/IEEE C64.41.2 for location category C-High. The SPD must comply with UL 1449. The SPD performance must be tested under ANSI/IEEE C62.45 based on ANSI/IEEE C62.41.2 definitions for standard and optional waveforms for location category C-High.

The luminaires and associated on-board circuitry must comply with the Class A emission limits provided in 47 CFR 15, subpart B concerning the emission of electronic noise.

86-6.01B(5) Compatibility

The luminaire must be operationally compatible with currently used lighting control systems and photoelectric controls.

86-6.01B(6) Photometric Requirements

The luminaire must maintain a minimum illuminance level throughout the minimum operating life. The L70 of the luminaire must be the minimum operating life or greater. The measurements must be calibrated to standard photopic calibrations. The minimum maintained illuminance values measured at a point must be as shown in the following table:

Application	Mounting height (ft)	Minimum maintained illuminance (fc)	Light pattern figure (isofootcandle curve)
Roadway 1	34	0.15	<p>Pattern defined by an ellipse with the equation:</p> $\frac{x^2}{(82)^2} + \frac{(y - 20)^2}{(52)^2} = 1$ <p>where: x = direction longitudinal to the roadway y = direction transverse to the roadway and the luminaire is offset from the center of the pattern by 20 feet to the house side of the pattern.</p>
Roadway 2	40	0.2	<p>Pattern defined by an ellipse with the equation:</p> $\frac{x^2}{(82)^2} + \frac{(y - 20)^2}{(52)^2} = 1$ <p>where: x = direction longitudinal to the roadway y = direction transverse to the roadway and the luminaire is offset from the center of the pattern by 20 feet to the house side of the pattern.</p>
Roadway 3	40	0.2	<p>Pattern defined by an ellipse with the equation:</p> $\frac{x^2}{(92)^2} + \frac{(y - 23)^2}{(55)^2} = 1$ <p>for $y \geq 0$ (street side)</p> <p>where: x = direction longitudinal to the roadway y = direction transverse to the roadway and the luminaire is offset from the center of the pattern by 23 feet to the house side of the pattern.</p>

Roadway 4	40	0.2	<p>Pattern defined by an ellipse with the equation:</p> $\frac{x^2}{(92)^2} + \frac{(y - 23)^2}{(55)^2} = 1$ <p>where: x = direction longitudinal to the roadway y = direction transverse to the roadway and the luminaire is offset from the center of the pattern by 23 feet to the house side of the pattern.</p>
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The luminaire must have a correlated color temperature range from 3,500 to 6,500 K. The color rendering index must be 65 or greater.

The luminaire must not allow more than:

1. 10 percent of the rated lumens to project above 80 degrees from vertical
2. 2.5 percent of the rated lumens to project above 90 degrees from vertical

86-6.01B(7) Thermal Management

The passive thermal management of the heat generated by the LEDs must have enough capacity to ensure proper operation of the luminaire over the minimum operation life. The LED maximum junction temperature for the minimum operation life must not exceed 221 degrees F.

The junction-to-ambient thermal resistance must be 95 degrees F per watt or less. The use of fans or other mechanical devices is not allowed. The heat sink material must be aluminum or other material of equal or lower thermal resistance.

The luminaire must contain circuitry that automatically reduces the power to the LEDs to a level that ensures the maximum junction temperature is not exceeded when the ambient outside air temperature is 100 degrees F or greater.

86-6.01B(8) Physical and Mechanical Requirements

The luminaire must be a single, self-contained device, not requiring job site assembly for installation. The power supply for the luminaire is integral to the unit. The weight of the luminaire must not exceed 35 lb. The maximum effective projected area when viewed from either side or either end must be 1.4 sq ft. The housing color must match a color no. from 26152 to 26440 or from 36231 to 36375, or color no. 36440 of FED-STD-595.

The housing must be fabricated from materials designed to withstand a 3,000-hour salt spray test under ASTM B 117. All aluminum used in housings and brackets must be of a marine grade alloy with less than 0.2 percent copper. All exposed aluminum must be anodized.

Each refractor or lens must be made from UV-inhibited high impact plastic such as acrylic or polycarbonate or heat- and impact-resistant glass and be resistant to scratching. Polymeric materials except lenses of enclosures containing either the power supply or electronic components of the luminaire must be made of UL94VO flame retardant materials. Paint or powder coating of the housing must comply with section 86-2.16. A chromate conversion undercoating must be used underneath a thermoplastic polyester powder coat.

Each housing must be provided with a slip fitter capable of mounting on a 2-inch pipe tenon. This slip fitter must fit on mast arms with outside diameters from 1-5/8 to 2-3/8 inches. The slip fitter must be capable of being adjusted a minimum of ±5 degrees from the axis of the tenon in a minimum of five steps: +5, +2.5, 0, -2.5, -5. The clamping brackets of the slip fitter must not bottom out on the housing bosses when adjusted within the designed angular range. No part of the slip fitter mounting brackets on the luminaires must develop a permanent set in excess of 1/32 inch when the two or four 3/8-inch diameter cap screws used for mounting are tightened to 10 ft-lb. Two sets of cap screws may be furnished to allow the slip fitter to be mounted on the pipe tenon in the acceptable range without the cap screws bottoming out in the threaded holes. The cap screws and the clamping brackets must be made of corrosion resistant

materials or treated to prevent galvanic reactions and be compatible with the luminaire housing and the mast arm.

The assembly and manufacturing process for the LED luminaire must be designed to ensure internal components are adequately supported to withstand mechanical shock and vibration from high winds and other sources. When tested under California Test 611, the luminaire to be mounted horizontally on the mast arm must be capable of withstanding the following cyclic loading for a minimum of 2 million cycles without failure of any luminaire part:

Cyclic Loading		
Plane	Power supply	Minimum peak acceleration level
Vertical	Installed	3.0 g peak-to-peak sinusoidal loading (same as 1.5 g peak)
Horizontal ^a	Installed	1.5 g peak-to-peak sinusoidal loading (same as 0.75 g peak)

^aPerpendicular to the direction of the mast arm

The housing must be designed to prevent the buildup of water on top of the housing. Exposed heat sink fins must be oriented to allow water to freely run off of the luminaire and carry dust and other accumulated debris away from the unit. The optical assembly of the luminaire must be protected against dust and moisture intrusion to at least an ANSI/IEC rating of IP66. The power supply enclosure must be protected to at least an ANSI/IEC rating of IP43.

Each mounted luminaire must be furnished with an ANSI C136.10-compliant, locking type photocontrol receptacle and a rain tight shorting cap. The receptacle must comply with section 86-6.11A.

When the components are mounted on a down-opening door, the door must be hinged and secured to the luminaire housing separately from the refractor or flat lens frame. The door must be secured to the housing such that accidental opening is prevented. A safety cable must mechanically connect the door to the housing.

Field wires connected to the luminaire must terminate on a barrier type terminal block secured to the housing. The terminal screws must be captive and equipped with wire grips for conductors up to no. 6. Each terminal position must be clearly identified.

The power supply must be rated for outdoor operation and have at least an ANSI/IEC rating of IP65.

The power supply must be rated for a minimum operational life equal to the minimum operational life of the luminaire or greater.

The power supply case temperature must have a self rise of 77 degrees F or less above ambient temperature in free air with no additional heat sinks.

The power supply must have 2 leads to accept standard 0-10 V(dc). The dimming control must be compatible with IEC 60929. If the control leads are open or the analog control signal is lost, the circuit must default to 100-percent power.

Conductors and terminals must be identified.

Add to section 86-6.08:

86-6.08E CITY DECORATIVE ELECTROLIER

86-6.08E(1) General

Section 86-6.08E includes specifications for installing City decorative electroliers, shown on the plans as "City Decorative Street Light".

This involves material designated by specific brand or trade name to match other products in use on a particular public improvement either completed or in the course of completion.

Install units in conformance with the details shown on the plans, the provisions in the Standard Specifications, and these special provisions.

86-6.08E(1)(a) Submittals

Submit manufacturer's warranty documentation as an informational submittal before installing decorative electroliers.

86-6.08E(2) Equipment

City decorative electrolier must be units as manufactured by Louis Poulsen Lighting.

Arrangements have been made to ensure that any successful bidder can obtain the specified equipment listed below directly from OCS Lighting and Control, Inc., 5797 Chesapeake Ct., Suite 200, San Diego, CA 92123, telephone (858) 514-4000. Refer to Quote OCS12-19889-1.

The equipment and quoted prices are:

Equipment Description	Quantity	Quoted Price/EA	Extended Price
Kipp Post LED Luminaire (KIP-PT-60WLED-4000K-120-277V-NATPAINTALU-T-RSA-4.5)	64	\$2,100	\$134,400
Dual Round Pole (RSA-4.5-10FEET-NATPAINTALU)	64	\$1,025	\$65,600
		TOTAL	\$200,000

Price includes freight charges for one shipment

Fractional orders or multiple shipments may incur additional charges.

Contact the vendor for information regarding tax, delivery details and location.

Quoted prices for equipment are guaranteed by OCS Lighting and Control, Inc. until 12/31/2013.

Add to section 86-6.08:

86-6.08F MONUMENT SIGN LIGHTING FIXTURE

86-6.08F(1) General

Section 86-6.08F includes specifications for installing monument sign lighting fixtures, shown on the plans as "Monument Sign Light".

This involves material designated by specific brand or trade name to match other products in use on a particular public improvement either completed or in the course of completion.

Install units in conformance with the details shown on the plans, the provisions in the Standard Specifications, and these special provisions.

86-6.08F(1)(a) Submittals

Submit manufacturer's warranty documentation as an informational submittal before installing monument sign lighting fixtures.

86-6.08F(2) Equipment

Monument sign lighting fixtures must be units as manufactured by Bronzelite, a Philips group brand., 100 Craftway Drive, Littlestown, PA 17340, telephone (800) 273-1569.

Arrangements have been made to ensure that any successful bidder can obtain the specified equipment listed below directly from Western Light Source, 9999 Businesspark Avenue, Suite B, San Diego, CA 92131, telephone (858) 564-0233. Refer to Quote A27884.

The equipment and quoted prices are:

Equipment Description	Quantity	Quoted Price/EA	Extended Price
Monument sign lighting fixture - without lamp (TLB8100-F-120/BIBH1001)	3	(Note 1)-	(Note 1)
		TOTAL	(Note 1)

Note 1: Quoted price is part of a larger quote. See "Parking Lot Light" elsewhere in these special provisions.

Furnish lamps suitable for the luminaire type and meeting the lighting fixture manufacturer's requirements.

Fractional orders or multiple shipments may incur additional charges.

Contact the vendor for information regarding tax, shipping, handling, delivery details and location.

Quoted prices for equipment are guaranteed by Western Light Source until 12/31/2012.

Add to section 86-6.08:

86-6.08G PARKING LOT ELECTROLIER

86-6.08G(1) General

Section 86-6.08G includes specifications for installing parking lot electroliers, shown on the plans as "Parking Lot Light".

This involves material designated by specific brand or trade name to match other products in use on a particular public improvement either completed or in the course of completion.

Install units in conformance with the details shown on the plans, the provisions in the Standard Specifications, and these special provisions.

86-6.08G(1)(a) Submittals

Submit manufacturer's warranty documentation as an informational submittal before installing parking lot electrolier.

86-6.08G(2) Equipment

Parking lot electrolier must be units as manufactured by Philips Gardco, 1611 Clovis Barker Road, San Marcos, TX 78666, telephone (800) 227-0758.

Arrangements have been made to ensure that any successful bidder can obtain the specified equipment listed below directly from Western Light Source, 9999 Businesspark Avenue, Suite B, San Diego, CA 92131, telephone (858) 564-0233. Refer to Quote A27884.

The equipment and quoted prices are:

Equipment Description	Quantity	Quoted Price/EA	Extended Price
Single Luminaire Lighting Standard - without lamp			
EH1413-150MH-240-NA	18		
SSA4.5-STB-20-D1-NP	18		
Double Luminaire Lighting Standard - without lamp			
EH1423-150MH-240-NA	10		
SSA4.5-STB-20-D2-NP	10		
Monument Sign Lighting Fixture (Note 1)			(Note 1)
		TOTAL (Note 1)-	\$63,320.25

Note 1: Quoted price includes monument sign lights. See "Monument Sign Light" elsewhere in these special provisions.

Furnish lamps suitable for the luminaire type and meeting the luminaire manufacturer's requirements.

Fractional orders or multiple shipments may incur additional charges.

Contact the vendor for information regarding tax, shipping, handling, delivery details and location.

Quoted prices for equipment are guaranteed by Western Light Source until 12/31/2012.

Add to section 86-6.08:

86-6.08H STEP LIGHTING FIXTURE

86-6.08H(1) General

Section 86-6.08H includes specifications for installing LED step lighting fixtures.

Step lighting fixtures, shown on the plans as "Step Light" and "Pilaster Step Light", must be a flush-type designed for recessed installation into a wall or other structure.

Fixtures must be either of the following, or equal, and must be of the same model throughout the project:

1. Steplyte (Model No. RSC2 H K5 D5 E) as manufactured by Hadco, a Philips group brand, 100 Craftway Drive, Littlestown, PA 17340, telephone (800) 331-4185
2. LED Brick (Model No. LBL-L-WH-BZ) as manufactured by National Specialty Lighting, 1753 Boxelder Street, Louisville, CO 80027, telephone (800) 527-2923.
3. LED Brick Light with Angled Louver (Model No. ELST81BZ) as manufactured by ELCO Lighting, 2042 East Vernon Avenue, Vernon, CA 90058, telephone (323) 231-2600.

86-6.08H(1)(a) Submittals

Product submittals must include:

1. Shop drawings showing installation details of the fixtures. Details include physical placement of the fixtures showing fitting details, provisions for weather proofing, conduit entry, grounding, and wiring termination.
2. Manufacturer's product specification sheet and product manual.
3. Replacement parts list.
4. Written warranty.

Submit shop drawing, product specification sheet, product manual, replacement parts list and warranty documentation as an informational submittal before installing fixtures.

86-6.08H(2) Quality Control and Assurance

86-6.08H(2)(a) General

The fixtures must be energized for a minimum of 24 hours, at 100 percent on-time duty cycle, at a temperature of +70 degrees F before performing acceptance testing.

86-6.08H(2)(b) Warranty

Written warranty must cover at least a 60-month period with not less than a 48-month period remaining after the successful acceptance testing of the fixtures. The warranty must consist of not less than a 12-month manufacturer's warranty with additional coverage being either from the manufacturer or another party who is engaged in the business of providing warranties.

86-6.08H(3) Materials

The luminaire must include an assembly that uses LEDs as the light source. The assembly must include a housing, glass lens, cover with bronze finish, an LED array, and an electronic driver. The luminaire must:

1. Have a housing of die-cast aluminum or cast bronze
1. Be UL listed or ETL certified for wet locations or have an equivalent standard from a recognized testing laboratory
2. Have a minimum operational life of 55,000 hours

86-6.08H(4) Electrical Requirements

The luminaire must operate at 120 V(ac) from a 60 ± 3 Hz AC power source. The fluctuations of line voltage must have no visible effect on the luminous output.

86-6.08H(5) Photometric Requirements

The luminaire must have a correlated color temperature range from 3,000 to 5,500 K.

86-6.08H(6) Physical and Mechanical Requirements

The installed fixture must be fully enclosed, raintight and corrosion resistant

The dimensions of the fixture housing must range from 7-1/2 to 9 inches wide, 2-1/4 to 4-1/4 inches high, and 3 to 4 inches deep.

The dimensions of the cover must not be larger than 10 inches wide, 4-1/2 inches high, and extend no more than 1 1/2 inches from the housing.

The weight of the luminaire must not exceed 6 lb.

86-6.08H(7) Installation

Coordinate the installation of step lighting fixtures with construction of the wall or other structure receiving the fixture. Nominal dimensions for fitting step lighting fixtures are shown on the plans, verify dimensions of the step lighting fixtures used in the work and adjust the field installation dimensions.

Install the fixtures per the approved shop drawings and per manufacturer recommendations.

Add to section 86-6.11B(1):

Photoelectric units for illuminated signs must have a "turn-on" level between 20 and 30 foot-candles, corresponding to a switching level of approximately 40 to 60 foot-candles measured in the horizontal plane. "Turn-off" level must not exceed 3 times the "turn-on" level.

Add to section 86-8.01:

Payment for highway lighting at interesections in connection with signals is included in the payment for signal and lighting.

Payment for other roadway lighting on the project is included in the payment for lighting or lighting and sign illumination.

For each item shown in the following table, the Department deducts the corresponding amount shown:

Source Inspection Expense Deductions

Item	Distance ^a	Deduction
Service equipment enclosures Contractor-furnished closed circuit television cabinets Contractor-furnished traffic monitoring station cabinets	> 300	\$2,000

^aDistance is air-line miles from both Sacramento and Los Angeles to the inspection source.

**DIVISION X MATERIALS
87 MATERIALS—GENERAL**

**Replace section 87-2 with:
87-2 AGGREGATE**

87-2.01 GENERAL

87-2.01A Summary

Section 87-2 includes specifications for furnishing aggregate.

87-2.01B Definitions

stockpile lot: Stockpile or portion of a stockpile of steel slag aggregate used.

87-2.01C Submittals

Submit a certificate of compliance for:

1. Each stockpile lot
2. Steel slag

87-2.02 MATERIALS

87-2.02A General

Do not use air-cooled iron blast furnace slag to produce aggregate for:

1. Structure backfill material
2. Pervious backfill material
3. Permeable material
4. Reinforced or prestressed PCC component or structure
5. Nonreinforced PCC component or structure for which a Class 1 surface finish under section 51-1.03F(3) is required

Do not use aggregate produced from slag resulting from a steel-making process except in:

1. Imported borrow
2. AS
3. Class 2 AB
4. HMA

Steel slag used to produce aggregate for AS and Class 2 AB must be crushed such that 100 percent of the material will pass a 3/4-inch sieve and then control aged for at least 3 months under conditions that will maintain all portions of the stockpiled material at a moisture content in excess of 6 percent of the dry weight of the aggregate.

For steel slag aggregate, provide separate stockpiles for controlled aging of the slag. An individual stockpile must not contain less than 10,000 tons or more than 50,000 tons of slag. The material in each

individual stockpile must be assigned a unique lot number, and each stockpile must be identified with a permanent system of signs. Maintain a permanent record of:

1. Dates for:
 - 1.1. Completion of stockpile
 - 1.2. Start of controlled aging
 - 1.3. Completion of controlled aging
 - 1.4. Making of tests
2. Test results

For each stockpile of steel slag aggregate, moisture tests must be made at least once each week. The time covered by tests that show a moisture content of 6 percent or less is not included in the aging time.

Notify METS and the Engineer upon completion of each stockpile and the start of controlled aging and upon completion of controlled aging. Do not add aggregate to a stockpile unless a new aging period is started.

Steel slag used for imported borrow must be weathered for at least 3 months.

Each delivery of aggregate containing steel slag for AS or Class 2 AB must include a delivery tag for each load. The tag must identify the lot by the stockpile number, slag aging location, and stockpile completion and controlled aging start date.

You may blend air-cooled iron blast furnace slag or natural aggregate in proper combinations with steel slag aggregate to produce the specified gradings.

California Test 202 is modified by California Test 105 whenever the difference in sp gr between the coarse and fine portions of the aggregate or between the blends of different aggregates is 0.2 or more.

For slag used as aggregate in HMA, the Kc factor requirements in California Test 303 do not apply.

If steel slag aggregates are used to produce HMA, no other aggregates may be used in the mixture except that up to 50 percent of the material passing the no. 4 sieve may consist of iron blast furnace slag aggregates, natural aggregates, or a combination of these. If iron blast furnace aggregates, natural aggregates, or a combination of these are used in the mixture, each aggregate type must be fed to the drier at a uniform rate. Maintain the feed rate of each aggregate type within 10 percent of the amount set. Provide adequate means for controlling and checking the feeder accuracy.

Store steel slag aggregate separately from iron blast furnace slag aggregate. Store each slag aggregate type separately from natural aggregate.

For HMA produced from steel slag aggregates, iron blast furnace slag aggregates, natural aggregates, or any combination of these, the same aggregate must be used throughout any one layer. Once an aggregate type is selected, do not change it without authorization.

Aggregate containing slag must comply with the applicable quality requirements for the bid items in which the aggregate is used.

87-2.03 CONSTRUCTION

Do not place aggregate produced from slag within 1 foot of a non-cathodically protected pipe or structure unless the aggregate is incorporated in concrete pavement, in HMA, or in treated base.

Do not place slag aggregate used for embankments within 18 inches of finished slope lines measured normal to the plane of the slope.

Whenever slag aggregate is used for imported borrow, place a layer of topsoil at least 24 inches thick after compaction over the slag aggregate in highway planting areas.

87-2.04 PAYMENT

The Department reduces the payment quantity of HMA if:

1. Steel slag aggregates are used to produce HMA
2. The sp gr of a compacted stabilometer test specimen is in excess of 2.40

Physical property	Requirement
Particle size distribution Less than 45 microns Less than 10 microns	95 percent 50 percent
Strength activity index with portland cement ^b 7 days 28 days	95 percent (min percent of control) 110 percent (min percent of control)
Expansion at 16 days when testing project materials under ASTM C 1567 ^c	0.10 percent max
Surface area when testing by nitrogen adsorption under ASTM D 5604	40.0 m ² /g min

^aSiO₂ in crystalline form must not exceed 1.0 percent.

^bWhen tested under AASHTO M 307 for strength activity testing of silica fume.

^cIn the test mix, Type II or V portland cement must be replaced with at least 12 percent rice hull ash by weight.

For the purpose of calculating the equations for the cementitious material specifications, consider rice hull ash to be represented by the variable *UF*.

**Replace section 90-7 with:
90-7 PERVIOUS CONCRETE**

90-7.01 GENERAL

90-7.01A Summary

Section 90-7 includes specifications for furnishing and curing pervious concrete.

Pervious concrete must comply with the specifications for minor concrete, except that section 90-2.02B does not apply.

90-7.01B Definitions

Not Used

90-7.01C Submittals

Before starting pervious concrete work, submit:

1. Test results for the void content of hardened concrete. Use core specimens obtained from a previous project that used the same mix design. Calculate void content under 90-7.01D(3).
2. Test results for the void content of fresh concrete under ASTM C 1688/C 1688M.

90-7.01D Quality Control and Assurance

90-7.01D(1) General

Not Used

90-7.01D(2) Penetration

The specifications for penetration in section 90-1.02G(6) do not apply to pervious concrete.

90-7.01D(3) Void Content

The Engineer calculates void content of a core specimen using the following equation:

$$V = 100 - [(Ws - Wi) \times 4 \times F / (H \times D^2 \times Pi)] \times 100$$

where:

V = void content, percent

Ws = saturated weight of the core under ASTM C 140, lb or g

**REVISED STANDARD SPECIFICATIONS
APPLICABLE TO THE 2010 EDITION
OF THE STANDARD SPECIFICATIONS**

REVISED STANDARD SPECIFICATIONS PUBLISHED ON 07-27-12

Revised standard specifications are under headings that correspond with the main-section headings of the *Standard Specifications*. A main-section heading is a heading shown in the table of contents of the *Standard Specifications*. A date under a main-section heading is the date of the latest revision to the section.

Each revision to the *Standard Specifications* begins with a revision clause that describes a revision to the *Standard Specifications* or introduces a revision to the *Standard Specifications*. For a revision clause that describes a revision, the date on the right above the clause is the publication date of the revision. For a revision clause that introduces a revision, the date on the right above a revised term, phrase, clause, paragraph, or section is the publication date of the revised term, phrase, clause, paragraph, or section. For a multiple-paragraph or multiple-section revision, the date on the right above a paragraph or section is the publication date of the paragraphs or sections that follow.

Any paragraph added by a revision clause does not change the paragraph numbering of the *Standard Specifications* for any other reference to a paragraph of the *Standard Specifications*.

DIVISION I GENERAL PROVISIONS

1 GENERAL

06-20-12

Replace "current" in the 2nd paragraph of section 1-1.05 with:

most recent

04-20-12

Add to the 4th paragraph of section 1-1.05:

04-20-12

Any reference directly to a revised standard specification section is for convenience only. Lack of a direct reference to a revised standard specification section does not indicate a revised standard specification for the section does not exist.

Delete the abbreviation and its meaning for *UDBE* in the 1st table of section 1-1.06.

06-20-12

Add to section 1-1.07B:

06-20-12

Disadvantaged Business Enterprise: Disadvantaged Business Enterprise as defined in 49 CFR 26.5.

Replace "PO BOX 911" in the District 3 mailing address in the table in section 1-1.08 with:

703 B ST

04-20-12

5 CONTROL OF WORK

07-20-12

Replace the 1st and 2nd sentences in the 7th paragraph of section 5-1.13B(1) with:

06-20-12

If a DBE is decertified before completing its work, the DBE must notify you in writing of the decertification date. If a business becomes a certified DBE before completing its work, the business must notify you in writing of the certification date.

Replace "90" in the last sentence of the 7th paragraph of section 5-1.13B(1) with:

06-20-12

30

Replace "Underutilized" in "Underutilized Disadvantaged Business Enterprises" in the heading of section 5-1.13B(2) with:

06-20-12

Performance of

Delete *U* in *UDBE* at each occurrence in section 5-1.13B(2).

06-20-12

Replace the 3rd paragraph of section 5-1.13B(2) with:

06-20-12

Do not terminate or substitute a listed DBE for convenience and perform the work with your own forces or obtain materials from other sources without authorization from the Department.

Replace item 6 in the list in the 4th paragraph of section 5-1.13B(2) with:

06-20-12

6. Listed DBE is ineligible to work on the project because of suspension or debarment.

Add to the list in the 4th paragraph of section 5-1.13B(2):

06-20-12

8. Listed DBE voluntarily withdraws with written notice from the Contract.
9. Listed DBE is ineligible to receive credit for the type of work required.
10. Listed DBE owner dies or becomes disabled resulting in the inability to perform the work on the Contract.
11. Department determines other documented good cause.

Add between the 4th and 5th paragraphs of section 5-1.13B(2):

07-20-12

Notify the original DBE of your intent to use other forces or material sources and provide the reasons. Provide the DBE with 5 days to respond to your notice and advise you and the Department of the reasons why the use of other forces or sources of materials should not occur. Your request to use other forces or material sources must include:

1. 1 or more of the reasons listed in the preceding paragraph
2. Notices from you to the DBE regarding the request
3. Notices from the DBE to you regarding the request

FHWA-1273 Nondiscrimination Clauses

FHWA-1273 section	FHWA-1273 clause	Department clause
Training and Promotion	In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision.	If section 7-1.11D applies, section 7-1.11D supersedes this subparagraph.
Records and Reports	If on-the-job training is being required by special provision, the contractor will be required to collect and report training data.	If the Contract requires on-the-job training, collect and report training data.

Replace the form in section 7-1.11B with:

07-20-12

**REQUIRED CONTRACT PROVISIONS
FEDERAL-AID CONSTRUCTION CONTRACTS**

- I. General
- II. Nondiscrimination
- III. Nonsegregated Facilities
- IV. Davis-Bacon and Related Act Provisions
- V. Contract Work Hours and Safety Standards Act Provisions
- VI. Subletting or Assigning the Contract
- VII. Safety: Accident Prevention
- VIII. False Statements Concerning Highway Projects
- IX. Implementation of Clean Air Act and Federal Water Pollution Control Act
- X. Compliance with Governmentwide Suspension and Debarment Requirements
- XI. Certification Regarding Use of Contract Funds for Lobbying

ATTACHMENTS

A. Employment and Materials Preference for Appalachian Development Highway System or Appalachian Local Access Road Contracts (included in Appalachian contracts only)

I. GENERAL

1. Form FHWA-1273 must be physically incorporated in each construction contract funded under Title 23 (excluding emergency contracts solely intended for debris removal). The contractor (or subcontractor) must insert this form in each subcontract and further require its inclusion in all lower tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services).

The applicable requirements of Form FHWA-1273 are incorporated by reference for work done under any purchase order, rental agreement or agreement for other services. The prime contractor shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

Form FHWA-1273 must be included in all Federal-aid design-build contracts, in all subcontracts and in lower tier subcontracts (excluding subcontracts for design services, purchase orders, rental agreements and other agreements for supplies or services). The design-builder shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

Contracting agencies may reference Form FHWA-1273 in bid proposal or request for proposal documents, however, the Form FHWA-1273 must be physically incorporated (not referenced) in all contracts, subcontracts and lower-tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services related to a construction contract).

2. Subject to the applicability criteria noted in the following sections, these contract provisions shall apply to all work performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's immediate superintendence and to all work performed on the contract by piecework, station work, or by subcontract.

3. A breach of any of the stipulations contained in these Required Contract Provisions may be sufficient grounds for withholding of progress payments, withholding of final payment, termination of the contract, suspension / debarment or any other action determined to be appropriate by the contracting agency and FHWA.

4. Selection of Labor: During the performance of this contract, the contractor shall not use convict labor for any purpose within the limits of a construction project on a Federal-aid highway unless it is labor performed by convicts who are on parole, supervised release, or probation. The term Federal-aid highway does not include roadways functionally classified as local roads or rural minor collectors.

II. NONDISCRIMINATION

The provisions of this section related to 23 CFR Part 230 are applicable to all Federal-aid construction contracts and to all related construction subcontracts of \$10,000 or more. The provisions of 23 CFR Part 230 are not applicable to material supply, engineering, or architectural service contracts.

In addition, the contractor and all subcontractors must comply with the following policies: Executive Order 11246, 41 CFR 60, 29 CFR 1625-1627, Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The contractor and all subcontractors must comply with: the requirements of the Equal Opportunity Clause in 41 CFR 60-1.4(b) and, for all construction contracts exceeding \$10,000, the Standard Federal Equal Employment Opportunity Construction Contract Specifications in 41 CFR 60-4.3.

Note: The U.S. Department of Labor has exclusive authority to determine compliance with Executive Order 11246 and the policies of the Secretary of Labor including 41 CFR 60, and 29 CFR 1625-1627. The contracting agency and the FHWA have the authority and the responsibility to ensure compliance with Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), and Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The following provision is adopted from 23 CFR 230, Appendix A, with appropriate revisions to conform to the U.S. Department of Labor (US DOL) and FHWA requirements.

1. Equal Employment Opportunity: Equal employment opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (28 CFR 35, 29 CFR 1630, 29 CFR 1625-1627, 41 CFR 60 and 49 CFR 27) and orders of the Secretary of Labor as modified by the provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140 shall constitute the EEO and specific affirmative action standards for the contractor's project activities under

this contract. The provisions of the Americans with Disabilities Act of 1990 (42 U.S.C. 12101 et seq.) set forth under 28 CFR 35 and 29 CFR 1630 are incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:

a. The contractor will work with the contracting agency and the Federal Government to ensure that it has made every good faith effort to provide equal opportunity with respect to all of its terms and conditions of employment and in their review of activities under the contract.

b. The contractor will accept as its operating policy the following statement:

"It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, color, national origin, age or disability. Such action shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, pre-apprenticeship, and/or on-the-job training."

2. EEO Officer: The contractor will designate and make known to the contracting officers an EEO Officer who will have the responsibility for and must be capable of effectively administering and promoting an active EEO program and who must be assigned adequate authority and responsibility to do so.

3. Dissemination of Policy: All members of the contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action, or who are substantially involved in such action, will be made fully cognizant of, and will implement, the contractor's EEO policy and contractual responsibilities to provide EEO in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:

a. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's EEO policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer.

b. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer, covering all major aspects of the contractor's EEO obligations within thirty days following their reporting for duty with the contractor.

c. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer in the contractor's procedures for locating and hiring minorities and women.

d. Notices and posters setting forth the contractor's EEO policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.

e. The contractor's EEO policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.

4. Recruitment: When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be placed in publications having a large circulation among minorities and women in the area from which the project work force would normally be derived.

a. The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minorities and women. To meet this requirement, the contractor will identify sources of potential minority group employees, and establish with such identified sources procedures whereby minority and women applicants may be referred to the contractor for employment consideration.

b. In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, the contractor is expected to observe the provisions of that agreement to the extent that the system meets the contractor's compliance with EEO contract provisions. Where implementation of such an agreement has the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Federal nondiscrimination provisions.

c. The contractor will encourage its present employees to refer minorities and women as applicants for employment. Information and procedures with regard to referring such applicants will be discussed with employees.

5. Personnel Actions: Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, national origin, age or disability. The following procedures shall be followed:

a. The contractor will conduct periodic inspections of project sites to insure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.

b. The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.

c. The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.

d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with its obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of their avenues of appeal.

6. Training and Promotion:

a. The contractor will assist in locating, qualifying, and increasing the skills of minorities and women who are

applicants for employment or current employees. Such efforts should be aimed at developing full journey level status employees in the type of trade or job classification involved.

b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs, i.e., apprenticeship, and on-the-job training programs for the geographical area of contract performance. In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision. The contracting agency may reserve training positions for persons who receive welfare assistance in accordance with 23 U.S.C. 140(a).

c. The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.

d. The contractor will periodically review the training and promotion potential of employees who are minorities and women and will encourage eligible employees to apply for such training and promotion.

7. Unions: If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use good faith efforts to obtain the cooperation of such unions to increase opportunities for minorities and women. Actions by the contractor, either directly or through a contractor's association acting as agent, will include the procedures set forth below:

a. The contractor will use good faith efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minorities and women for membership in the unions and increasing the skills of minorities and women so that they may qualify for higher paying employment.

b. The contractor will use good faith efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, national origin, age or disability.

c. The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the contracting agency and shall set forth what efforts have been made to obtain such information.

d. In the event the union is unable to provide the contractor with a reasonable flow of referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, national origin, age or disability; making full efforts to obtain qualified and/or qualifiable minorities and women. The failure of a union to provide sufficient referrals (even though it is obligated to provide exclusive referrals under the terms of a collective bargaining agreement) does not relieve the contractor from the requirements of this paragraph. In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these special provisions, such contractor shall immediately notify the contracting agency.

8. Reasonable Accommodation for Applicants / Employees with Disabilities: The contractor must be familiar

with the requirements for and comply with the Americans with Disabilities Act and all rules and regulations established there under. Employers must provide reasonable accommodation in all employment activities unless to do so would cause an undue hardship.

9. Selection of Subcontractors, Procurement of Materials and Leasing of Equipment: The contractor shall not discriminate on the grounds of race, color, religion, sex, national origin, age or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment. The contractor shall take all necessary and reasonable steps to ensure nondiscrimination in the administration of this contract.

a. The contractor shall notify all potential subcontractors and suppliers and lessors of their EEO obligations under this contract.

b. The contractor will use good faith efforts to ensure subcontractor compliance with their EEO obligations.

10. Assurance Required by 49 CFR 26.13(b):

a. The requirements of 49 CFR Part 26 and the State DOT's U.S. DOT-approved DBE program are incorporated by reference.

b. The contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the contracting agency deems appropriate.

11. Records and Reports: The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years following the date of the final payment to the contractor for all contract work and shall be available at reasonable times and places for inspection by authorized representatives of the contracting agency and the FHWA.

a. The records kept by the contractor shall document the following:

(1) The number and work hours of minority and non-minority group members and women employed in each work classification on the project;

(2) The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women; and

(3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minorities and women;

b. The contractors and subcontractors will submit an annual report to the contracting agency each July for the duration of the project, indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on [Form FHWA-1391](#). The staffing data should represent the project work force on board in all or any part of the last payroll period preceding the end of July. If on-the-job training is being required by special provision, the contractor

will be required to collect and report training data. The employment data should reflect the work force on board during all or any part of the last payroll period preceding the end of July.

III. NONSEGREGATED FACILITIES

This provision is applicable to all Federal-aid construction contracts and to all related construction subcontracts of \$10,000 or more.

The contractor must ensure that facilities provided for employees are provided in such a manner that segregation on the basis of race, color, religion, sex, or national origin cannot result. The contractor may neither require such segregated use by written or oral policies nor tolerate such use by employee custom. The contractor's obligation extends further to ensure that its employees are not assigned to perform their services at any location, under the contractor's control, where the facilities are segregated. The term "facilities" includes waiting rooms, work areas, restaurants and other eating areas, time clocks, restrooms, washrooms, locker rooms, and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing provided for employees. The contractor shall provide separate or single-user restrooms and necessary dressing or sleeping areas to assure privacy between sexes.

IV. DAVIS-BACON AND RELATED ACT PROVISIONS

This section is applicable to all Federal-aid construction projects exceeding \$2,000 and to all related subcontracts and lower-tier subcontracts (regardless of subcontract size). The requirements apply to all projects located within the right-of-way of a roadway that is functionally classified as Federal-aid highway. This excludes roadways functionally classified as local roads or rural minor collectors, which are exempt. Contracting agencies may elect to apply these requirements to other projects.

The following provisions are from the U.S. Department of Labor regulations in 29 CFR 5.5 "Contract provisions and related matters" with minor revisions to conform to the FHWA-1273 format and FHWA program requirements.

1. Minimum wages

a. All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions

of paragraph 1.d. of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph 1.b. of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

b.(1) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(i) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(ii) The classification is utilized in the area by the construction industry; and

(iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(2) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(3) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Wage and Hour Administrator for determination. The Wage and Hour Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or

will notify the contracting officer within the 30-day period that additional time is necessary.

(4) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs 1.b.(2) or 1.b.(3) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

c. Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

d. If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program. Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

2. Withholding

The contracting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract, or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the contracting agency may, after written notice to the contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

3. Payrolls and basic records

a. Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-

Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

b.(1) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the contracting agency. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <http://www.dol.gov/esa/whd/forms/wh347instr.htm> or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the contracting agency for transmission to the State DOT, the FHWA or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the contracting agency..

(2) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(i) That the payroll for the payroll period contains the information required to be provided under §5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under §5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(ii) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(iii) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(3) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 3.b.(2) of this section.

(4) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

c. The contractor or subcontractor shall make the records required under paragraph 3.a. of this section available for inspection, copying, or transcription by authorized representatives of the contracting agency, the State DOT, the FHWA, or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the FHWA may, after written notice to the contractor, the contracting agency or the State DOT, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

4. Apprentices and trainees

a. Apprentices (programs of the USDOL).

Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice.

The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.

Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly

rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination.

In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

b. Trainees (programs of the USDOL).

Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration.

The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration.

Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.

In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

c. Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

- d. Apprentices and Trainees (programs of the U.S. DOT).

Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeymen shall not be greater than permitted by the terms of the particular program.

5. Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

6. Subcontracts. The contractor or subcontractor shall insert Form FHWA-1273 in any subcontracts and also require the subcontractors to include Form FHWA-1273 in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

7. Contract termination; debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

9. Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

10. Certification of eligibility.

a. By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

b. No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

c. The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

V. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

The following clauses apply to any Federal-aid construction contract in an amount in excess of \$100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by 29 CFR 5.5(a) or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

1. Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

2. Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (1.) of this section, the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1.) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1.) of this section.

3. Withholding for unpaid wages and liquidated damages. The FHWA or the contracting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2.) of this section.

4. Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (1.) through (4.) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (1.) through (4.) of this section.

VI. SUBLETTING OR ASSIGNING THE CONTRACT

This provision is applicable to all Federal-aid construction contracts on the National Highway System.

1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the contracting agency. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR 635.116).

a. The term "perform work with its own organization" refers to workers employed or leased by the prime contractor, and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor or lower tier subcontractor, agents of the prime contractor, or any other assignees. The term may include payments for the costs of hiring leased employees from an employee leasing firm meeting all relevant Federal and State regulatory requirements. Leased employees may only be included in this term if the prime contractor meets all of the following conditions:

(1) the prime contractor maintains control over the supervision of the day-to-day activities of the leased employees;

(2) the prime contractor remains responsible for the quality of the work of the leased employees;

(3) the prime contractor retains all power to accept or exclude individual employees from work on the project; and

(4) the prime contractor remains ultimately responsible for the payment of predetermined minimum wages, the submission of payrolls, statements of compliance and all other Federal regulatory requirements.

b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid or propose on the contract as a whole and in general are to be limited to minor components of the overall contract.

2. The contract amount upon which the requirements set forth in paragraph (1) of Section VI is computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.

3. The contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the contracting officer determines is necessary to assure the performance of the contract.

4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the contracting agency has assured that each subcontract is

evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract.

5. The 30% self-performance requirement of paragraph (1) is not applicable to design-build contracts; however, contracting agencies may establish their own self-performance requirements.

VII. SAFETY: ACCIDENT PREVENTION

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR 635). The contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the contracting officer may determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract.

2. It is a condition of this contract, and shall be made a condition of each subcontract, which the contractor enters into pursuant to this contract, that the contractor and any subcontractor shall not permit any employee, in performance of the contract, to work in surroundings or under conditions which are unsanitary, hazardous or dangerous to his/her health or safety, as determined under construction safety and health standards (29 CFR 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3704).

3. Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of compliance with the construction safety and health standards and to carry out the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C.3704).

VIII. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, Form FHWA-1022 shall be posted on each Federal-aid highway project (23 CFR 635) in one or more places where it is readily available to all persons concerned with the project:

18 U.S.C. 1020 reads as follows:

"Whoever, being an officer, agent, or employee of the United States, or of any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or

Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 1, 1916, (39 Stat. 355), as amended and supplemented;

Shall be fined under this title or imprisoned not more than 5 years or both."

IX. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

By submission of this bid/proposal or the execution of this contract, or subcontract, as appropriate, the bidder, proposer, Federal-aid construction contractor, or subcontractor, as appropriate, will be deemed to have stipulated as follows:

1. That any person who is or will be utilized in the performance of this contract is not prohibited from receiving an award due to a violation of Section 508 of the Clean Water Act or Section 306 of the Clean Air Act.
2. That the contractor agrees to include or cause to be included the requirements of paragraph (1) of this Section X in every subcontract, and further agrees to take such action as the contracting agency may direct as a means of enforcing such requirements.

X. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

This provision is applicable to all Federal-aid construction contracts, design-build contracts, subcontracts, lower-tier subcontracts, purchase orders, lease agreements, consultant contracts or any other covered transaction requiring FHWA approval or that is estimated to cost \$25,000 or more – as defined in 2 CFR Parts 180 and 1200.

1. Instructions for Certification – First Tier Participants:

- a. By signing and submitting this proposal, the prospective first tier participant is providing the certification set out below.
- b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this

covered transaction. The prospective first tier participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective first tier participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction.

c. The certification in this clause is a material representation of fact upon which reliance was placed when the contracting agency determined to enter into this transaction. If it is later determined that the prospective participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the contracting agency may terminate this transaction for cause of default.

d. The prospective first tier participant shall provide immediate written notice to the contracting agency to whom this proposal is submitted if any time the prospective first tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

e. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180 and 1200. "First Tier Covered Transactions" refers to any covered transaction between a grantee or subgrantee of Federal funds and a participant (such as the prime or general contract). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

f. The prospective first tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.

g. The prospective first tier participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transactions," provided by the department or contracting agency, entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the \$25,000 threshold.

h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website (<https://www.epls.gov/>), which is compiled by the General Services Administration.

i. Nothing contained in the foregoing shall be construed to require the establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of the prospective participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

j. Except for transactions authorized under paragraph (f) of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

2. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion – First Tier Participants:

a. The prospective first tier participant certifies to the best of its knowledge and belief, that it and its principals:

(1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency;

(2) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(3) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (a)(2) of this certification; and

(4) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

b. Where the prospective participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

2. Instructions for Certification - Lower Tier Participants:

(Applicable to all subcontracts, purchase orders and other lower tier transactions requiring prior FHWA approval or estimated to cost \$25,000 or more - 2 CFR Parts 180 and 1200)

a. By signing and submitting this proposal, the prospective lower tier is providing the certification set out below.

b. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department, or agency with which

this transaction originated may pursue available remedies, including suspension and/or debarment.

c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances.

d. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180 and 1200. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations. "First Tier Covered Transactions" refers to any covered transaction between a grantee or subgrantee of Federal funds and a participant (such as the prime or general contract). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

e. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.

f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the \$25,000 threshold.

g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website (<https://www.epls.gov/>), which is compiled by the General Services Administration.

h. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the

department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Lower Tier Participants:

1. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency.

2. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

XI. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts which exceed \$100,000 (49 CFR 20).

1. The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

2. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

3. The prospective participant also agrees by submitting its bid or proposal that the participant shall require that the language of this certification be included in all lower tier subcontracts, which exceed \$100,000 and that all such recipients shall certify and disclose accordingly.

Add to the list in the 1st paragraph of section 19-3.01A(2)(d):

01-20-12

9. Provisions for discontinuous rows of soil nails

Add to section 19-3.01A(3)(b):

01-20-12

For soil nail walls, wall zones are specified in the special provisions.

For ground anchor walls, a wall zone is the entire wall unless otherwise specified in the special provisions.

Delete the 2nd sentence in the 4th paragraph of section 19-3.01A(3)(b).

01-20-12

Replace the 1st paragraph of section 19-3.03E(3) with:

01-20-12

Compact structure backfill behind lagging of soldier pile walls by hand tamping, mechanical compaction, or other authorized means.

Replace the 2nd paragraph of section 19-3.03F with:

01-20-12

Do not backfill over or place material over slurry cement backfill until 4 hours after placement. When concrete sand is used as aggregate and the in-place material is free draining, you may start backfilling as soon as the surface water is gone.

Add between the 2nd and 3rd paragraphs of section 19-3.03K:

01-20-12

Before you excavate for the installation of ground anchors in a wall zone:

1. Complete stability testing
2. Obtain authorization of test data

Replace the 2nd sentence of the 7th paragraph of section 19-3.03K:

01-20-12

Stop construction in unstable areas until remedial measures have been taken. Remedial measures must be submitted and authorized.

Add between the 8th and 9th paragraphs of section 19-3.03K:

01-20-12

When your excavation and installation methods result in a discontinuous wall along any soil nail row, the ends of the structurally completed wall section must extend beyond the ends of the next lower excavation lift by a distance equal to twice the lift height. Maintain temporary slopes at the ends of each wall section to ensure slope stability.

HMA Mix Design Requirements

Quality characteristic	Test method	HMA type		
		A	B	RHMA-G
Air void content (%)	California Test 367	4.0	4.0	Section 39-1.03B
Voids in mineral aggregate (% min.)	California Test 367			
No. 4 grading		17.0	17.0	--
3/8" grading		15.0	15.0	--
1/2" grading		14.0	14.0	18.0–23.0 ^a
3/4" grading		13.0	13.0	18.0–23.0 ^a
Voids filled with asphalt (%)	California Test 367			Note c
No. 4 grading		65.0–75.0	65.0–75.0	
3/8" grading		65.0–75.0	65.0–75.0	
1/2" grading		65.0–75.0	65.0–75.0	
3/4" grading		65.0–75.0	65.0–75.0	
Dust proportion	California Test 367			Note c
No. 4 and 3/8" gradings		0.6–1.2	0.6–1.2	
1/2" and 3/4" gradings		0.6–1.2	0.6–1.2	
Stabilometer value (min.) ^b	California Test 366			
No. 4 and 3/8" gradings		30	30	--
1/2" and 3/4" gradings		37	35	23

^a Voids in mineral aggregate for RHMA-G must be within this range.

^b California Test 304, Part 2C.12.

^c Report this value in the JMF submittal.

Replace item 4 in the list in the 1st paragraph of section 39-1.03C with:

4. JMF renewal on a *Caltrans Job Mix Formula Renewal* form, if applicable

01-20-12

Replace the 2nd paragraph of section 39-1.03E with:

Use the OBC specified on your *Contractor Hot Mix Asphalt Design Data* form. No adjustments to asphalt binder content are allowed. Based on your testing and production experience, you may submit an adjusted aggregate gradation TV on a *Contractor Job Mix Formula Proposal* form before verification testing. Aggregate gradation TV must be within the TV limits specified in the aggregate gradation tables.

04-20-12

Add between the 3rd and 4th paragraphs of section 39-1.03E:

Asphalt binder set point for HMA must be the OBC specified on your *Contractor Hot Mix Asphalt Design Data* form. When RAP is used, asphalt binder set point for HMA must be:

04-20-12

$$\text{Asphalt Binder Set Point} = \frac{\frac{BC_{OBC}}{\left(1 - \frac{BC_{OBC}}{100}\right)} - R_{RAP} \left[\frac{BC_{RAP}}{\left(1 - \frac{BC_{RAP}}{100}\right)} \right]}{100 + \frac{BC_{OBC}}{\left(1 - \frac{BC_{OBC}}{100}\right)}}$$

Where:

BC_{OBC} = optimum asphalt binder content, percent based on total weight of mix

R_{RAP} = RAP ratio by weight of aggregate

BC_{RAP} = asphalt binder content of RAP, percent based on total weight of RAP mix

Replace item 4 in the list in the 8th paragraph of section 39-1.03E with:

04-20-12

4. HMA quality specified in the table titled "HMA Mix Design Requirements" except:
 - 4.1. Air void content, design value ± 2.0 percent
 - 4.2. Voids filled with asphalt, report only
 - 4.3. Dust proportion, report only

Replace the 12th paragraph of section 39-1.03E with:

04-20-12

If tests on plant-produced samples do not verify the JMF, the Engineer notifies you and you must submit a new JMF or submit an adjusted JMF based on your testing. JMF adjustments may include a change in aggregate gradation TV within the TV limits specified in the aggregate gradation tables.

Replace the 14th paragraph of section 39-1.03E with:

01-20-12

A verified JMF is valid for 12 months.

Replace the last sentence in the 15th paragraph of section 39-1.03E with:

01-20-12

This deduction does not apply to verifications initiated by the Engineer or JMF renewal.

Add between the 1st and 2nd paragraphs of section 39-1.03F:

04-20-12

Target asphalt binder content on your Contractor *Job Mix Formula Proposal* form and the OBC specified on your *Contractor Hot Mix Asphalt Design Data* form must be the same.

Delete the 4th paragraph of section 39-1.03F.

01-20-12

Replace items 3 and 5 in the list in the 6th paragraph of section 39-1.03F with:

01-20-12

3. Engineer verifies each proposed JMF renewal within 20 days of receiving verification samples.
5. For each HMA type and aggregate gradation specified, the Engineer verifies at the Department's expense 1 proposed JMF renewal within a 12-month period.

Add between the 6th and 7th paragraphs of section 39-1.03F:

01-20-12

The most recent aggregate quality test results within the past 12 months may be used for verification of JMF renewal or the Engineer may perform aggregate quality tests for verification of JMF renewal.

Replace section 39-1.03G with:

04-20-12

39-1.03G Job Mix Formula Modification

For an accepted JMF, you may change asphalt binder source one time during production.

Submit your modified JMF request a minimum of 3 business days before production. Each modified JMF submittal must consist of:

1. Proposed modified JMF on *Contractor Job Mix Formula Proposal* form
2. Mix design records on *Contractor Hot Mix Asphalt Design Data* form for the accepted JMF to be modified
3. JMF verification on *Hot Mix Asphalt Verification* form for the accepted JMF to be modified
4. Quality characteristics test results for the modified JMF as specified in section 39-1.03B. Perform tests at the mix design OBC as shown on the *Contractor Asphalt Mix Design Data* form
5. If required, California Test 371 test results for the modified JMF.

With an accepted modified JMF submittal, the Engineer verifies each modified JMF within 5 business days of receiving all verification samples. If California Test 371 is required, the Engineer tests for California Test 371 within 10 days of receiving verification samples.

The Engineer verifies the modified JMF after the modified JMF HMA is placed on the project and verification samples are taken within the first 750 tons following sampling requirements in section 39-1.03E, "Job Mix Formula Verification." The Engineer tests verification samples for compliance with:

1. Stability as shown in the table titled "HMA Mix Design Requirements"
2. Air void content at design value ± 2.0 percent
3. Voids in mineral aggregate as shown in the table titled "HMA Mix Design Requirements"
4. Voids filled with asphalt, report only
5. Dust proportion, report only

If the modified JMF is verified, the Engineer revises your *Hot Mix Asphalt Verification* form to include the new asphalt binder source. Your revised form will have the same expiration date as the original form.

If a modified JMF is not verified, stop production and any HMA placed using the modified JMF is rejected.

The Engineer deducts \$2,000 from payments for each modified JMF verification. The Engineer deducts an additional \$2,000 for each modified JMF verification that requires California Test 371.

Add to section 39-1.03:

01-20-12

39-1.03H Job Mix Formula Acceptance

You may start HMA production if:

1. The Engineer's review of the JMF shows compliance with the specifications.
2. The Department has verified the JMF within 12 months before HMA production.
3. The Engineer accepts the verified JMF.

Replace "3 days" in the 1st paragraph of section 39-1.04A with:

01-20-12

3 business days

Replace the 2nd sentence in the 2nd paragraph of section 39-1.04A with:

01-20-12

During production, take samples under California Test 125. You may sample HMA from:

Replace "5 days" in the 1st paragraph of section 39-1.06 with:

01-20-12

5 business days

Replace the 3rd paragraph of section 39-1.08A with:

04-20-12

During production, you may adjust hot or cold feed proportion controls for virgin aggregate and RAP.

Add to section 39-1.08A:

04-20-12

During production, asphalt binder set point for HMA Type A, HMA Type B, HMA Type C, and RHMA-G must be the OBC shown in *Contractor Hot Mix Asphalt Design Data* form. For OGFC, asphalt binder set point must be the OBC shown on *Caltrans Hot Mix Asphalt Verification* form. If RAP is used, asphalt binder set point for HMA must be calculated as specified in section 39-1.03E.

You must request adjustments to the plant asphalt binder set point based on new RAP stockpiles average asphalt binder content. Do not adjust the HMA plant asphalt binder set point until authorized.

Replace the 3rd paragraph of section 39-1.08B with:

09-16-11

Asphalt rubber binder must be from 375 to 425 degrees F when mixed with aggregate.

Replace the 15th paragraph of section 39-1.11 with:

01-20-12

For Standard and QC/QA construction processes, if 3/4-inch aggregate grading is specified, you may use a 1/2-inch aggregate grading if the specified total paved thickness is at least 0.15 foot and less than 0.20 foot thick.

Replace the 17th paragraph of section 39-1.11 with:

01-20-12

Do not open new HMA pavement to public traffic until its mid-depth temperature is below 160 degrees F.

Replace the 5th and 6th paragraphs of section 39-1.12C with:

07-20-12

On tangents and horizontal curves with a centerline radius of curvature 2,000 feet or more, the PI_0 must be at most 2.5 inches per 0.1-mile section.

On horizontal curves with a centerline radius of curvature between 1,000 feet and 2,000 feet including pavement within the superelevation transitions, the PI_0 must be at most 5 inches per 0.1-mile section.

Add to section 39-1.12:

01-20-12

39-1.12E Reserved

Add to section 39-1.14:

01-20-12

Prepare the area to receive HMA for miscellaneous areas and dikes, including any excavation and backfill as needed.

Replace "6.8" in item 3 in the list in the 4th paragraph of section 39-1.14 with:

04-20-12

6.4

Replace "6.0" in item 3 in the list in the 4th paragraph of section 39-1.14 with:

04-20-12

5.7

Replace "6.8" in the 1st paragraph of section 39-1.15B with:

04-20-12

6.4

Replace "6.0" in the 1st paragraph of section 39-1.15B with:

04-20-12

5.7

Replace the 1st paragraph of section 39-2.02B with:

04-20-12

Perform sampling and testing at the specified frequency for the quality characteristics shown in the following table:

Minimum Quality Control—Standard Construction Process

Quality characteristic	Test method	Minimum sampling and testing frequency	HMA type			
			A	B	RHMA-G	OGFC
Aggregate gradation ^a	California Test 202	1 per 750 tons and any remaining part at the end of the project	JMF ± Tolerance ^b			
Sand equivalent (min) ^c	California Test 217		47	42	47	--
Asphalt binder content (%)	California Test 379 or 382		JMF±0.40	JMF±0.40	JMF ± 0.40	JMF ± 0.40
HMA moisture content (% max)	California Test 226 or 370	1 per 2,500 tons but not less than 1 per paving day	1.0	1.0	1.0	1.0
Field compaction (% max. theoretical density) ^{d,e}	QC plan	2 per business day (min.)	91–97	91–97	91–97	--
Stabilometer value (min) ^{c, f} No. 4 and 3/8" gradings 1/2" and 3/4" gradings	California Test 366	One per 4,000 tons or 2 per 5 business days, whichever is greater	30	30	--	--
			37	35	23	--
Air void content (%) ^{c, g}	California Test 367		4 ± 2	4 ± 2	TV ± 2	--
Aggregate moisture content at continuous mixing plants and RAP moisture content at continuous mixing plants and batch mixing plants ^h	California Test 226 or 370	2 per day during production	--	--	--	--
Percent of crushed particles coarse aggregate (% min) One fractured face Two fractured faces Fine aggregate (% min) (Passing no. 4 sieve and retained on no. 8 sieve.) One fractured face	California Test 205	As designated in the QC plan. At least once per project	90	25	--	90
			75	--	90	75
			70	20	70	90
Los Angeles Rattler (% max) Loss at 100 rev.	California Test 211		12	--	12	12

Loss at 500 rev.			45	50	40	40
Flat and elongated particles (% max by weight @ 5:1)	California Test 235		Report only	Report only	Report only	Report only
Fine aggregate angularity (% min) ⁱ	California Test 234		45	45	45	--
Voids filled with asphalt (%) ^j No. 4 grading 3/8" grading 1/2" grading 3/4" grading	California Test 367		65.0–75.0 65.0–75.0 65.0–75.0 65.0–75.0	65.0–75.0 65.0–75.0 65.0–75.0 65.0–75.0	Report only	--
Voids in mineral aggregate (% min) ^j No. 4 grading 3/8" grading 1/2" grading 3/4" grading	California Test 367		17.0 15.0 14.0 13.0	17.0 15.0 14.0 13.0	-- -- 18.0–23.0 ^k 18.0–23.0 ^k	--
Dust proportion ^j No. 4 and 3/8" gradings 1/2" and 3/4" gradings	California Test 367		0.6-1.2 0.6–1.2	0.6-1.2 0.6–1.2	Report only	--
Smoothness	Section 39-1.12	--	12-foot straight-edge, must grind, and PI ₀	12-foot straight-edge, must grind, and PI ₀	12-foot straight-edge, must grind, and PI ₀	12-foot straight-edge, must grind, and PI ₀
Asphalt rubber binder viscosity @ 375 °F, centipoises	Section 39-1.02D	Section 39-1.04C	--	--	1,500–4,000	1,500–4,000
Asphalt modifier	Section 39-1.02D	Section 39-1.04C	--	--	Section 39-1.02D	Section 39-1.02D
CRM	Section 39-1.02D	Section 39-1.04C	--	--	Section 39-1.02D	Section 39-1.02D

^a Determine combined aggregate gradation containing RAP under California Test 367.

^b The tolerances must comply with the allowable tolerances in section 39-1.02E.

^c Report the average of 3 tests from a single split sample.

^d Determine field compaction for any of the following conditions:

1. 1/2-inch, 3/8-inch, or no. 4 aggregate grading is used and the specified total paved thickness is at least 0.15 foot.
2. 3/4-inch aggregate grading is used and the specified total paved thickness is at least 0.20 foot.

^e To determine field compaction use:

1. In-place density measurements using the method specified in your QC plan.
2. California Test 309 to determine the maximum theoretical density at the frequency specified in California Test 375, Part 5C.

^f California Test 304, Part 2C.12.

^g Determine the bulk specific gravity of each lab-compacted briquette under California Test 308, Method A, and theoretical maximum specific gravity under California Test 309.

^h For adjusting the plant controller at the HMA plant.

ⁱ The Engineer waives this specification if HMA contains 10 percent or less of nonmanufactured sand by weight of total aggregate. Manufactured sand is fine aggregate produced by crushing rock or gravel.

^j Report only.

^k Voids in mineral aggregate for RHMA-G must be within this range.

Replace the 1st paragraph of section 39-2.03A with:

04-20-12

The Department samples for acceptance testing and tests for the quality characteristics shown in the following table:

HMA Acceptance—Standard Construction Process

Quality characteristic	Test method	HMA type						
		A	B	RHMA-G	OGFC			
Aggregate gradation^a	California Test 202	JMF ± tolerance ^c	JMF ± tolerance ^c	JMF ± tolerance ^c	JMF ± tolerance ^c			
Sieve						3/4"	1/2"	3/8"
1/2"						X ^b		
3/8"							X	
No. 4								X
No. 8						X	X	X
No. 200	X	X	X					
Sand equivalent (min) ^d	California Test 217	47	42	47	--			
Asphalt binder content (%)	California Test 379 or 382	JMF±0.40	JMF±0.40	JMF ± 0.40	JMF ± 0.40			
HMA moisture content (% , max)	California Test 226 or 370	1.0	1.0	1.0	1.0			
Field compaction (% max. theoretical density) ^{e, f}	California Test 375	91–97	91–97	91–97	--			
Stabilometer value (min) ^{d, g}	California Test 366	30 37	30 35	-- 23	-- --			
No. 4 and 3/8" gradings								
1/2" and 3/4" gradings								
Air void content (%) ^{d, h}	California Test 367	4 ± 2	4 ± 2	TV ± 2	--			
Percent of crushed particles	California Test 205	90 75	25 --	-- 90	90 75			
Coarse aggregate (% , min)								
One fractured face								
Two fractured faces								
Fine aggregate (% , min)	California Test 205	70	20	70	90			
(Passing no. 4 sieve and retained on no. 8 sieve.)								
One fractured face								
Los Angeles Rattler (% , max)	California Test 211	12 45	-- 50	12 40	12 40			
Loss at 100 rev.								
Loss at 500 rev.								
Fine aggregate angularity (% , min) ⁱ	California Test 234	45	45	45	--			
Flat and elongated particles (% , max by weight @ 5:1)	California Test 235	Report only	Report only	Report only	Report only			
Voids filled with asphalt (%) ^j	California Test 367	65.0–75.0 65.0–75.0 65.0–75.0 65.0–75.0	65.0–75.0 65.0–75.0 65.0–75.0 65.0–75.0	Report only	--			
No. 4 grading								
3/8" grading								
1/2" grading								
3/4" grading								
Voids in mineral aggregate (% min) ^j	California Test 367	17.0 15.0	17.0 15.0	-- --	-- --			
No. 4 grading								
3/8" grading								

1/2" grading 3/4" grading		14.0 13.0	14.0 13.0	18.0–23.0 ^k 18.0–23.0 ^k	
Dust proportion ^j No. 4 and 3/8" gradings 1/2" and 3/4" gradings	California Test 367	0.6-1.2 0.6–1.2	0.6-1.2 0.6–1.2	Report only	--
Smoothness	Section 39-1.12	12-foot straight- edge, must grind, and PI ₀	12-foot straight- edge, must grind, and PI ₀	12-foot straight- edge, must grind, and PI ₀	12-foot straight- edge and must grind
Asphalt binder	Various	Section 92	Section 92	Section 92	Section 92
Asphalt rubber binder	Various	--	--	Section 92- 1.01D(2) and section 39-1.02D	Section 92-1.01D(2) and section 39-1.02D
Asphalt modifier	Various	--	--	Section 39-1.02D	Section 39-1.02D
CRM	Various	--	--	Section 39-1.02D	Section 39-1.02D

^a The Engineer determines combined aggregate gradations containing RAP under California Test 367.

^b "X" denotes the sieves the Engineer tests for the specified aggregate gradation.

^c The tolerances must comply with the allowable tolerances in section 39-1.02E.

^d The Engineer reports the average of 3 tests from a single split sample.

^e The Engineer determines field compaction for any of the following conditions:

1. 1/2-inch, 3/8-inch, or no. 4 aggregate grading is used and the specified total paved thickness is at least 0.15 foot.
2. 3/4-inch aggregate grading is used and the specified total paved thickness is at least 0.20 foot.

^f To determine field compaction, the Engineer uses:

1. California Test 308, Method A, to determine in-place density of each density core.
2. California Test 309 to determine the maximum theoretical density at the frequency specified in California Test 375, Part 5C.

^g California Test 304, Part 2C.12.

^h The Engineer determines the bulk specific gravity of each lab-compacted briquette under California Test 308, Method A, and theoretical maximum specific gravity under California Test 309.

ⁱ The Engineer waives this specification if HMA contains 10 percent or less of nonmanufactured sand by weight of total aggregate. Manufactured sand is fine aggregate produced by crushing rock or gravel.

^j Report only.

^k Voids in mineral aggregate for RHMA-G must be within this range.

Replace the 5th paragraph of section 39-2.03A with:

01-20-12

The Engineer determines the percent of maximum theoretical density from density cores taken from the final layer measured the full depth of the total paved HMA thickness if any of the following applies:

1. 1/2-inch, 3/8-inch, or no. 4 aggregate grading is used and the specified total paved thickness is at least 0.15 foot and any layer is less than 0.15 foot.
2. 3/4-inch aggregate grading is used and the specified total paved thickness is at least 0.2 foot and any layer is less than 0.20 foot.

Replace the 1st paragraph of section 39-3.02A with:

04-20-12

The Department samples for acceptance testing and tests for the quality characteristics shown in the following table:

HMA Acceptance—Method Construction Process

Quality characteristic	Test method	HMA type			
		A	B	RHMA-G	OGFC
Aggregate gradation ^a	California Test 202	JMF ± tolerance ^b	JMF ± tolerance ^b	JMF ± tolerance ^b	JMF ± tolerance ^b
Sand equivalent (min) ^c	California Test 217	47	42	47	--
Asphalt binder content (%)	California Test 379 or 382	JMF±0.40	JMF±0.40	JMF ± 0.40	JMF ± 0.40
HMA moisture content (% max)	California Test 226 or 370	1.0	1.0	1.0	1.0
Stabilometer value (min) ^{c, d} No. 4 and 3/8" gradings 1/2" and 3/4" gradings	California Test 366	30 37	30 35	-- 23	-- --
Percent of crushed particles Coarse aggregate (% min) One fractured face Two fractured faces Fine aggregate (% min) (Passing no. 4 sieve and retained on no. 8 sieve.) One fractured face	California Test 205	90 75 70	25 -- 20	-- 90 70	90 75 90
Los Angeles Rattler (% max) Loss at 100 rev. Loss at 500 rev.	California Test 211	12 45	-- 50	12 40	12 40
Air void content (%) ^{c, e}	California Test 367	4 ± 2	4 ± 2	TV ± 2	--
Fine aggregate angularity (% min)	California Test 234	45	45	45	--
Flat and elongated particles (% max by weight @ 5:1)	California Test 235	Report only	Report only	Report only	Report only
Voids filled with asphalt (%) ^g No. 4 grading 3/8" grading 1/2" grading 3/4" grading	California Test 367	65.0–75.0 65.0–75.0 65.0–75.0 65.0–75.0	65.0–75.0 65.0–75.0 65.0–75.0 65.0–75.0	Report only	--
Voids in mineral aggregate (% min) ^g No. 4 grading 3/8" grading 1/2" grading 3/4" grading	California Test 367	17.0 15.0 14.0 13.0	17.0 15.0 14.0 13.0	-- -- 18.0–23.0 ^h 18.0–23.0 ^h	--
Dust proportion ^g No. 4 and 3/8" gradings 1/2" and 3/4" gradings	California Test 367	0.6-1.2 0.6–1.2	0.6-1.2 0.6–1.2	Report only	--
Smoothness	Section 39-1.12	12-foot straight-edge and	12-foot straight-edge and	12-foot straight-edge and	12-foot straight-edge and

		must-grind	must-grind	must-grind	must-grind
Asphalt binder	Various	Section 92	Section 92	Section 92	Section 92
Asphalt rubber binder	Various	--	--	Section 92-1.01D(2) and section 39-1.02D	Section 92-1.01D(2) and section 39-1.02D
Asphalt modifier	Various	--	--	Section 39-1.02D	Section 39-1.02D
CRM	Various	--	--	Section 39-1.02D	Section 39-1.02D

^a The Engineer determines combined aggregate gradations containing RAP under California Test 367.

^b The tolerances must comply with the allowable tolerances in section 39-1.02E.

^c The Engineer reports the average of 3 tests from a single split sample.

^d California Test 304, Part 2C.12.

^e The Engineer determines the bulk specific gravity of each lab-compacted briquette under California Test 308, Method A, and theoretical maximum specific gravity under California Test 309.

^f The Engineer waives this specification if HMA contains 10 percent or less of nonmanufactured sand by weight of total aggregate. Manufactured sand is fine aggregate produced by crushing rock or gravel.

^g Report only.

^h Voids in mineral aggregate for RHMA-G must be within this range.

Replace "280 degrees F" in item 2 in the list in the 6th paragraph of section 39-3.04 with:

285 degrees F

01-20-12

Replace the 8th paragraph of section 39-4.02C with:

Comply with the values for the HMA quality characteristics and minimum random sampling and testing for quality control shown in the following table:

04-20-12

Minimum Quality Control—QC/QA Construction Process

Quality characteristic	Test method	Minimum sampling and testing frequency	HMA Type			Location of sampling	Maximum reporting time allowance
			A	B	RHMA-G		
Aggregate gradation ^a	California Test 202	1 per 750 tons	JMF ± tolerance ^b	JMF ± tolerance ^b	JMF ± tolerance ^b	California Test 125	24 hours
Asphalt binder content (%)	California Test 379 or 382		JMF±0.40	JMF±0.40	JMF ±0.40	Loose mix behind paver See California Test 125	
Field compaction (% max. theoretical density) ^{c,d}	QC plan		92–96	92–96	91–96	QC plan	
Aggregate moisture content at continuous mixing plants and RAP moisture content at continuous mixing plants and batch mixing plants ^e	California Test 226 or 370	2 per day during production	--	--	--	Stock-piles or cold feed belts	--
Sand equivalent (min) ^f	California Test 217	1 per 750 tons	47	42	47	California Test 125	24 hours
HMA moisture content (% max)	California Test 226 or 370	1 per 2,500 tons but not less than 1 per paving day	1.0	1.0	1.0	Loose Mix Behind Paver See California Test 125	24 hours
Stabilometer value (min) ^{f,g}	California Test 366	1 per 4,000 tons or 2 per 5 business days, whichever is greater	30	30	--		48 hours
No. 4 and 3/8" gradings 1/2" and 3/4" gradings			37	35	23		
Air void content (%) ^{f,h}	California Test 367		4 ± 2	4 ± 2	TV ± 2		

Percent of crushed particles coarse aggregate (% min.): One fractured face Two fractured faces	California Test 205		90	25	--	California Test 125	48 hours
Fine aggregate (% min) (Passing no. 4 sieve and retained on no. 8 sieve.): One fractured face			75	--	90		
Los Angeles Rattler (% max): Loss at 100 rev. Loss at 500 rev.	California Test 211	As designated in QC plan.	12	--	12	California Test 125	
Fine aggregate angularity (% min) ⁱ	California Test 234		45	50	40		
Flat and elongated particle (% max by weight @ 5:1)	California Test 235	At least once per project.	45	45	45	California Test 125	
Voids filled with asphalt (%) ⁱ : No. 4 grading 3/8" grading 1/2" grading 3/4" grading	California Test 367		Report only	Report only	Report only	California Test 125	
Voids in mineral aggregate (% min.) ^j : No. 4 grading 3/8" grading 1/2" grading 3/4" grading	California Test 367		65.0–75.0 65.0–75.0 65.0–75.0 65.0–75.0	65.0–75.0 65.0–75.0 65.0–75.0 65.0–75.0	Report only		
			17.0 15.0 14.0 13.0	17.0 15.0 14.0 13.0	-- -- 18.0– 23.0 ^k 18.0– 23.0 ^k		

Dust proportion ^j :	California Test 367						
No. 4 and 3/8" gradings			0.6-1.2	0.6-1.2	Report only		
1/2" and 3/4" gradings			0.6-1.2	0.6-1.2			
Smoothness	Section 39-1.12	--	12-foot straight-edge, must-grind, and PI ₀	12-foot straight-edge, must-grind, and PI ₀	12-foot straight-edge, must-grind, and PI ₀	--	
Asphalt rubber binder viscosity @ 375 °F, centipoises	Section 39-1.02D	--	--	--	1,500-4,000	Section 39-1.02D	24 hours
CRM	Section 39-1.02D	--	--	--	Section 39-1.02D	Section 39-1.02D	48 hours

^a Determine combined aggregate gradation containing RAP under California Test 367.

^b The tolerances must comply with the allowable tolerances in section 39-1.02E.

^c Determines field compaction for any of the following conditions:

1. 1/2-inch, 3/8-inch, or no. 4 aggregate grading is used and the specified total paved thickness is at least 0.15 foot.
2. 3/4-inch aggregate grading is used and the specified total paved thickness is at least 0.20 foot.

^d To determine field compaction use:

1. In-place density measurements using the method specified in your QC plan.
2. California Test 309 to determine the maximum theoretical density at the frequency specified in California Test 375, Part 5C.

^e For adjusting the plant controller at the HMA plant.

^f Report the average of 3 tests from a single split sample.

^g California Test 304, Part 2C, 12.

^h Determine the bulk specific gravity of each lab-compacted briquette under California Test 308, Method A, and theoretical maximum specific gravity under California Test 309.

ⁱ The Engineer waives this specification if HMA contains 10 percent or less of nonmanufactured sand by weight of total aggregate. Manufactured sand is fine aggregate produced by crushing rock or gravel.

^j Report only.

^k Voids in mineral aggregate for RHMA-G must be within this range.

Replace the 1st sentence in the 1st paragraph of section 39-4.03B(2) with:

01-20-12

For aggregate gradation and asphalt binder content, the minimum ratio of verification testing frequency to quality control testing frequency is 1:5.

Replace the 2nd "and" in the 7th paragraph of section 39-4.03B(2) with:

01-20-12

or

Replace the 1st paragraph of section 39-4.04A with:

04-20-12

The Engineer samples for acceptance testing and tests for the following quality characteristics:

HMA Acceptance—QC/QA Construction Process

Index (i)	Quality characteristic				Weighting factor (w)	Test method	HMA type		
							A	B	RHMA-G
		Aggregate gradation ^a				California Test 202	JMF ± Tolerance ^c		
	Sieve	3/4"	1/2"	3/8"					
1	1/2"	X ^b	--	--	0.05				
1	3/8"	--	X	--	0.05				
1	No. 4	--	--	X	0.05				
2	No. 8	X	X	X	0.10				
3	No. 200	X	X	X	0.15				
4	Asphalt binder content (%)				0.30	California Test 379 or 382	JMF±0.40	JMF±0.40	JMF ± 0.40
5	Field compaction (% max. theoretical density) ^{d, e}				0.40	California Test 375	92–96	92–96	91–96
	Sand equivalent (min) ^f					California Test 217	47	42	47
	Stabilometer value (min) ^{f, g} No. 4 and 3/8" gradings 1/2" and 3/4" gradings					California Test 366	30 37	30 35	-- 23
	Air void content (%) ^{f, h}					California Test 367	4 ± 2	4 ± 2	TV ± 2
	Percent of crushed particles coarse aggregate (% min) One fractured face Two fractured faces Fine aggregate (% min) (Passing no. 4 sieve and retained on No. 8 sieve.) One fractured face					California Test 205	90 75 70	25 -- 20	-- 90 70
	HMA moisture content (% max)					California Test 226 or 370	1.0	1.0	1.0
	Los Angeles Rattler (% max) Loss at 100 rev. Loss at 500 rev.					California Test 211	12 45	-- 50	12 40
	Fine aggregate angularity (% min) ⁱ					California Test 234	45	45	45
	Flat and elongated particle (% max by weight @ 5:1)					California Test 235	Report only	Report only	Report only
	Voids in mineral aggregate (% min) ^j No. 4 grading 3/8" grading 1/2" grading 3/4" grading					California Test 367	17.0 15.0 14.0 13.0	17.0 15.0 14.0 13.0	-- -- 18.0–23.0 18.0–23.0

	Voids filled with asphalt (%) ^j No. 4 grading 3/8" grading 1/2" grading 3/4" grading		California Test 367	65.0–75.0 65.0–75.0 65.0–75.0 65.0–75.0	65.0–75.0 65.0–75.0 65.0–75.0 65.0–75.0	Report only
	Dust proportion ^l No. 4 and 3/8" gradings 1/2" and 3/4" gradings		California Test 367	0.6–1.2 0.6–1.2	0.6–1.2 0.6–1.2	Report only
	Smoothness		Section 39-1.12	12-foot straight-edge, must grind, and P ₁₀	12-foot straight-edge, must grind, and P ₁₀	12-foot straight-edge, must grind, and P ₁₀
	Asphalt binder		Various	Section 92	Section 92	Section 92
	Asphalt rubber binder		Various	--	--	Section 92-1.01D(2) and section 39-1.02D
	Asphalt modifier		Various	--	--	Section 39-1.02D
	CRM		Various	--	--	Section 39-1.02D

^a The Engineer determines combined aggregate gradations containing RAP under California Test 367.

^b "X" denotes the sieves the Engineer tests for the specified aggregate gradation.

^c The tolerances must comply with the allowable tolerances in section 39-1.02E.

^d The Engineer determines field compaction for any of the following conditions:

1. 1/2-inch, 3/8-inch, or no. 4 aggregate grading is used and the specified total paved thickness is at least 0.15 foot and less than 0.20 foot.
2. 3/4-inch aggregate grading is used and the specified total paved thickness is at least 0.20 foot.

^e To determine field compaction, the Engineer uses:

1. California Test 308, Method A, to determine in-place density of each density core.
2. California Test 309 to determine the maximum theoretical density at the frequency specified in California Test 375, Part 5C.

^f The Engineer reports the average of 3 tests from a single split sample.

^g California Test 304, Part 2C.12.

^h The Engineer determines the bulk specific gravity of each lab-compacted briquette under California Test 308, Method A, and theoretical maximum specific gravity under California Test 309.

ⁱ The Engineer waives this specification if HMA contains 10 percent or less of nonmanufactured sand by weight of total aggregate. Manufactured sand is fine aggregate produced by crushing rock or gravel.

^j Report only.

^k Voids in mineral aggregate for RHMA-G must be within this range.

Replace the 3rd paragraph of section 39-4.04A with:

01-20-12

The Department determines the percent of maximum theoretical density from density cores taken from the final layer measured the full depth of the total paved HMA thickness if any of the following applies:

1. 1/2-inch, 3/8-inch, or no. 4 aggregate grading is used and the specified total paved thickness is at least 0.15 foot and any layer is less than 0.15 foot.
2. 3/4-inch aggregate grading is used and the specified total paved thickness is at least 0.20 and any layer is less than 0.20 foot.

AA

40 CONCRETE PAVEMENT

01-20-12

Replace section 40-1.01C(4) with:

01-20-12

40-1.01C(4) Authorized Laboratory

Submit for authorization the name of the laboratory you propose to use for testing the drilled core specimens for air content.

Replace the paragraph in section 40-1.01C(8) with:

01-20-12

Submit a plan for protecting concrete pavement during the initial 72 hours after paving when the forecasted minimum ambient temperature is below 40 degrees F.

Delete "determined under California Test 559" in section 40-1.01C(9).

01-20-12

Replace the 2nd and 3rd paragraphs in section 40-1.01D(4) with:

01-20-12

The QC plan must include details of corrective action to be taken if any process is out of control. As a minimum, a process is out of control if any of the following occurs:

1. For fine and coarse aggregate gradation, 2 consecutive running averages of 4 tests are outside the specification limits
2. For individual penetration or air content measurements:
 - 2.1. One point falls outside the suspension limit line
 - 2.2. Two points in a row fall outside the action limit line

Stop production and take corrective action for out of control processes or the Engineer rejects subsequent material.

Replace the 1st paragraph in section 40-1.01D(5) with:

01-20-12

Determine the minimum cementitious materials content. Use your value for minimum cementitious material content for *MC* in equation 1 and equation 2 of section 90-1.02B(3).

Replace the 1st sentence of the 3rd paragraph of section 40-1.01D(9) with:

01-20-12

Use a California profilograph to determine the concrete pavement profile.

Replace the title of the table in section 40-1.01D(13)(a) with:

01-20-12

Concrete Pavement Acceptance Testing

Replace the 2nd and 3rd paragraphs in section 40-1.01D(13)(a) with:

01-20-12

Pavement smoothness may be accepted based on the Department's testing. A single test represents no more than 0.1 mile.

Acceptance of modulus of rupture, thickness, dowel bar and tie bar placement, coefficient of friction, smoothness, and air content, does not constitute final concrete pavement acceptance.

Delete item 4 in the list in the 2nd paragraph in section 40-1.01D(13)(c)(2).

01-20-12

Replace items 1 and 2 in the list in the 2nd paragraph in 40-1.01D(13)(d) with:

01-20-12

1. For tangents and horizontal curves having a centerline radius of curvature 2,000 feet or more, the PI_0 must be at most 2-1/2 inches per 0.1-mile section.
2. For horizontal curves having a centerline radius of curvature from 1,000 to 2,000 feet including concrete pavement within the superelevation transitions of those curves, the PI_0 must be at most 5 inches per 0.1-mile section.

Replace the 1st and 2nd variables in the equation in section 40-1.01D(13)(f) with:

01-20-12

n_c = Number of your quality control tests (minimum of 6 required)
 n_v = Number of verification tests (minimum of 2 required)

Replace "Your approved third party independent testing laboratory" in the 4th paragraph of section 40-1.01D(13)(f) with:

01-20-12

The authorized laboratory

Replace item 2 in the list in the 2nd paragraph of section 40-1.01D(13)(g):

01-20-12

2. One test for every 4,000 square yards of concrete pavement with tie bars or remaining fraction of that area. Each tie bar test consists of 2 cores with 1 on each tie-bar-end to expose both ends and allow measurement.

Replace section 40-1.01D(13)(h) with:

01-20-12

40-1.01D(13)(h) Bar Reinforcement

Bar reinforcement is accepted based on inspection before concrete placement.

Replace the paragraph in section 40-1.02B(2) with:

01-20-12

PCC for concrete pavement must comply with section 90-1 except as otherwise specified.

Replace the paragraphs in section 40-1.02D with:

01-20-12

Bar reinforcement must be deformed bars.

If the project is not shown to be in high desert or any mountain climate region, bar reinforcement must comply with section 52.

If the project is shown to be in high desert or any mountain climate regions, bar reinforcement must be one of the following:

1. Epoxy-coated bar reinforcement under section 52-2.03B except bars must comply with either ASTM A 706/A 706M; ASTM A 996/A 996M; or ASTM A 615/A 615M, Grade 40 or 60. Bars must be handled under ASTM D 3963/D 3963M and section 52-2.02C.
2. Low carbon, chromium steel bar complying with ASTM A 1035/A 1035M

Replace the paragraphs in section 40-1.02E with:

01-20-12

Tie bars must be deformed bars.

If the project is not shown to be in high desert or any mountain climate region, tie bars must be one of the following:

1. Epoxy-coated bar reinforcement. Bars must comply with either section 52-2.02B or 52-2.03B except bars must comply with either ASTM A 706/A 706M; ASTM A 996/A 996M; or ASTM A 615/A 615M, Grade 40 or 60.
2. Stainless-steel bars. Bars must be descaled, pickled, polished, and solid stainless-steel bars under ASTM A 955/A 955M, Grade 60, UNS Designation S31603 or S31803.
3. Low carbon, chromium-steel bars under ASTM A 1035/A 1035M.

If the project is shown to be in high desert or any mountain climate region, tie bars must be one of the following:

1. Epoxy-coated bar reinforcement. Bars must comply with section 52-2.03B except bars must comply with either ASTM A 706/A 706M; ASTM A 996/A 996M; or ASTM A 615/A 615M, Grade 40 or 60.
2. Stainless-steel bars. Bars must be descaled, pickled, polished, and solid stainless-steel bars under ASTM A 955/A 955M, Grade 60, UNS Designation S31603 or S31803.

Fabricate, sample, and handle epoxy-coated tie bars under ASTM D 3963/D 3963M, section 52-2.02C, or section 52-2.03C.

Do not bend tie bars.

Replace the 1st, 2nd, and 3rd paragraphs in section 40-1.02F with:

01-20-12

Dowel bars must be plain bars. Fabricate, sample, and handle epoxy-coated dowel bars under ASTM D 3963/D 3963M and section 52-2.03C except each sample must be 18 inches long.

If the project is not shown to be in high desert or any mountain climate region, dowel bars must be one of the following:

1. Epoxy-coated bars. Bars must comply with ASTM A 615/A 615M, Grade 40 or 60. Epoxy coating must comply with either section 52-2.02B or 52-2.03B.
2. Stainless-steel bars. Bars must be descaled, pickled, polished, and solid stainless-steel bars under ASTM A 955/A 955M, Grade 60, UNS Designation S31603 or S31803.
3. Low carbon, chromium-steel bars under ASTM A 1035/A 1035M.

If the project is shown to be in high desert or any mountain climate region, dowel bars must be one of the following:

1. Epoxy-coated bars. Bars must comply with ASTM A 615/A 615M, Grade 40 or 60. Epoxy coating must comply with section 52-2.03B.
2. Stainless-steel bars. Bars must be descaled, pickled, polished, and solid stainless-steel bars under ASTM A 955/A 955M, Grade 60, UNS Designation S31603 or S31803.

Replace the paragraphs in section 40-1.02G with:

01-20-12

For dowel and tie bar baskets, wire must comply with ASTM A 82/A 82M and be welded under ASTM A 185/A 185M, Section 7.4. The minimum wire-size no. is W10. Use either U-frame or A-frame shaped assemblies.

If the project is not shown to be in high desert or any mountain climate region. Baskets may be epoxy-coated, and the epoxy coating must comply with either section 52-2.02B or 52-2.03B.

If the project is shown to be in high desert or any mountain climate region, wire for dowel bar and tie bar baskets must be one of the following:

1. Epoxy-coated wire complying with section 52-2.03B
2. Stainless-steel wire. Wire must be descaled, pickled, and polished solid stainless-steel. Wire must comply with (1) the chemical requirements in ASTM A 276/A 276M, UNS Designation S31603 or S31803 and (2) the tension requirements in ASTM A 1022/ A 1022M.

Handle epoxy-coated tie bar and dowel bar baskets under ASTM D 3963/D 3963M and either section 52-2.02B or 52-2.03B.

Fasteners must be driven fasteners under ASTM F 1667. Fasteners on lean concrete base or HMA must have a minimum shank diameter of 3/16 inch and a minimum shank length of 2-1/2 inches. For asphalt treated permeable base or cement treated permeable base, the shank diameter must be at least 3/16 inch and the shank length must be at least 5 inches.

Fasteners, clips, and washers must have a minimum 0.2-mil thick zinc coating applied by either electroplating or galvanizing.

Replace the 1st paragraph in section 40-1.02H with:

01-20-12

Chemical adhesive for drilling and bonding dowels and tie bars must be on the Authorized Material List. The Authorized Material List indicates the appropriate chemical adhesive system for the concrete temperature and installation conditions.

Replace section 40-1.02I(2) with:

01-20-12

40-1.02I(2) Silicone Joint Sealant

Silicone joint sealant must be on the Authorized Material List.

Replace the last sentence in section 40-1.02I(4) with:

01-20-12

Show evidence that the seals are compressed from 30 to 50 percent for the joint width at time of installation.

Replace the paragraph in section 40-1.02L with:

01-20-12

Water for core drilling may be obtained from a potable water source, or submit proof that it does not contain:

1. More than 1,000 parts per million of chlorides as Cl
2. More than 1,300 parts per million of sulfates as SO₄
3. Impurities that cause pavement discoloration or surface etching

Replace the paragraph in section 40-1.03B with:

01-20-12

Before placing concrete pavement, develop enough water supply for the work under section 17.

Replace the last paragraph in section 40-1.03D(1) with:

01-20-12

Removal of grinding residue must comply with section 42-1.03B.

Replace the 1st and 2nd paragraphs in section 40-1.03E(6)(c) with:

01-20-12

Install preformed compressions seals in isolation joints if specified in the special provisions.

Install longitudinal seals before transverse seals. Longitudinal seals must be continuous except splicing is allowed at intersections with transverse seals. Transverse seals must be continuous for the entire transverse length of concrete pavement except splices are allowed for widenings and staged construction. With a sharp instrument, cut across the longitudinal seal at the intersection with transverse construction joints. If the longitudinal seal does not relax enough to properly install the transverse seal, trim the longitudinal seal to form a tight seal between the 2 joints.

If splicing is authorized, splicing must comply with the manufacturer's written instructions.

Replace the last 2 paragraphs in section 40-1.03G with:

01-20-12

Construct additional test strips if you:

1. Propose different paving equipment including:
 - 1.1. Paver
 - 1.2. Dowel bar inserter
 - 1.3. Tie bar inserter
 - 1.4. Tining
 - 1.5. Curing equipment
2. Change concrete mix proportions

You may request authorization to eliminate the test strip if you use paving equipment and personnel from a Department project (1) for the same type of pavement and (2) completed within the past 12 months. Submit supporting documents and previous project information with your request.

Replace the 1st paragraph in section 40-1.03I with:

01-20-12

Place tie bars in compliance with the tolerances shown in the following table:

Tie Bar Tolerance

Dimension	Tolerance
Horizontal and vertical skew	10 degrees maximum
Longitudinal translation	± 2 inch maximum
Horizontal offset (embedment)	± 2 inch maximum
Vertical depth	1. Not less than 1/2 inch below the saw cut depth of joints 2. When measured at any point along the bar, not less than 2 inches clear of the pavement's surface and bottom

Replace item 4 in the list in the 2nd paragraph in section 40-1.03I with:

01-20-12

4. Use tie bar baskets. Anchor baskets at least 200 feet in advance of pavement placement activity. If you request a waiver, describe the construction limitations or restricted access preventing the advanced anchoring. After the baskets are anchored and before paving, demonstrate the tie bars do not move from their specified depth and alignment during paving. Use fasteners to anchor tie bar baskets.

Replace "The maximum distance below the depth shown must be 0.05 foot." in the table in section 40-1.03J with:

01-20-12

The maximum distance below the depth shown must be 5/8 inch.

Replace sections 40-1.03L and 40-1.03M with:

01-20-12

40-1.03L Finishing

40-1.03L(1) General

Reserved

40-1.03L(2) Preliminary Finishing

40-1.03L(2)(a) General

Preliminary finishing must produce a smooth and true-to-grade finish. After preliminary finishing, mark each day's paving with a stamp. The stamp must be authorized before paving starts. The stamp must be approximately 1 by 2 feet in size. The stamp must form a uniform mark from 1/8 to 1/4 inch deep. Locate the mark 20 ± 5 feet from the transverse construction joint formed at each day's start of paving and 1 ± 0.25 foot from the pavement's outside edge. The stamp mark must show the month, day, and year of placement and the station of the transverse construction joint. Orient the stamp mark so it can be read from the pavement's outside edge.

Do not apply more water to the pavement surface than can evaporate before float finishing and texturing are completed.

40-1.03L(2)(b) Stationary Side Form Finishing

If stationary side form construction is used, give the pavement a preliminary finish by the machine float method or the hand method.

If using the machine float method:

1. Use self-propelled machine floats.

2. Determine the number of machine floats required to perform the work at a rate equal to the pavement delivery rate. If the time from paving to machine float finishing exceeds 30 minutes, stop pavement delivery. When machine floats are in proper position, you may resume pavement delivery and paving.
3. Run machine floats on side forms or adjacent pavement lanes. If running on adjacent pavement, protect the adjacent pavement surface under section 40-1.03P. Floats must be hardwood, steel, or steel-shod wood. Floats must be equipped with devices that adjust the underside to a true flat surface.

If using the hand method, finish pavement smooth and true to grade with manually operated floats or powered finishing machines.

40-1.03L(2)(c) Slip-Form Finishing

If slip-form construction is used, the slip-form paver must give the pavement a preliminary finish. You may supplement the slip-form paver with machine floats.

Before the pavement hardens, correct pavement edge slump in excess of 0.02 foot exclusive of edge rounding.

40-1.03L(3) Final Finishing

After completing preliminary finishing, round the edges of the initial paving widths to a 0.04-foot radius. Round transverse and longitudinal construction joints to a 0.02-foot radius.

Before curing, texture the pavement. Perform initial texturing with a burlap drag or broom device that produces striations parallel to the centerline. Perform final texturing with a steel-tined device that produces grooves parallel with the centerline.

Construct longitudinal grooves with a self-propelled machine designed specifically for grooving and texturing pavement. The machine must have tracks to maintain constant speed, provide traction, and maintain accurate tracking along the pavement surface. The machine must have a single row of rectangular spring steel tines. The tines must be from 3/32 to 1/8 inch wide, on 3/4-inch centers, and must have enough length, thickness, and resilience to form grooves approximately 3/16 inch deep. The machine must have horizontal and vertical controls. The machine must apply constant down pressure on the pavement surface during texturing. The machines must not cause ravels.

Construct grooves over the entire pavement width in a single pass except do not construct grooves 3 inches from the pavement edges and longitudinal joints. Final texture must be uniform and smooth. Use a guide to properly align the grooves. Grooves must be parallel and aligned to the pavement edge across the pavement width. Grooves must be from 1/8 to 3/16 inch deep after the pavement has hardened.

For irregular areas and areas inaccessible to the grooving machine, you may hand-construct grooves under section 40-1.03L(2) using the hand method. Hand-constructed grooves must comply with the specifications for machine-constructed grooves.

Initial and final texturing must produce a coefficient of friction of at least 0.30 when tested under California Test 342. Notify the Engineer when the pavement is scheduled to be opened to traffic to allow at least 25 days for the Department to schedule testing for coefficient of friction. Notify the Engineer when the pavement is ready for testing which is the latter of:

1. Seven days after paving
2. When the pavement has attained a modulus of rupture of 550 psi

The Department tests for coefficient of friction within 7 days of receiving notification that the pavement is ready for testing.

Do not open the pavement to traffic unless the coefficient of friction is at least 0.30.

40-1.03M Reserved

Replace "Reserved" in section 49-3.02A(3)(a) with:

01-20-12

If plastic spacers are proposed for use, submit the manufacturer's data and a sample of the plastic spacer. Allow 10 days for review.

Replace item 2 in the list in the 1st paragraph of section 49-3.02A(3)(g) with:

01-20-12

2. Be sealed and signed by an engineer who is registered as a civil engineer in the State. This requirement is waived for either of the following conditions:
 - 2.1. The proposed mitigation will be performed under the current Department-published version of *ADSC Standard Mitigation Plan 'A' - Basic Repair* without exception or modification.
 - 2.2. The Engineer determines that the rejected pile does not require mitigation due to structural, geotechnical, or corrosion concerns, and you elect to repair the pile using the current Department-published version of *ADSC Standard Mitigation Plan 'B' - Grouting Repair* without exception or modification.

Replace item 1 in the list in the 1st paragraph of section 49-3.02A(4)(d)(ii) with:

01-20-12

1. Inspection pipes must be schedule 40 PVC pipe complying with ASTM D 1785 with a nominal pipe size of 2 inches. Watertight PVC couplers complying with ASTM D 2466 are allowed to facilitate pipe lengths in excess of those commercially available. Log the location of the inspection pipe couplers with respect to the plane of pile cutoff.

Add to section 49-3.02A(4)(d)(iv):

01-20-12

If the Engineer determines it is not feasible to use one of ADSC's standard mitigation plans to mitigate the pile, schedule a meeting and meet with the Engineer before submitting a nonstandard mitigation plan.

The meeting attendees must include your representatives and the Engineer's representatives involved in the pile mitigation. The purpose of the meeting is to discuss the type of pile mitigation acceptable to the Department.

Provide the meeting facility. The Engineer conducts the meeting.

Replace the 1st paragraph of section 49-3.02B(5) with:

01-20-12

Grout used to backfill casings must comply with section 50-1.02C, except:

1. Grout must consist of cementitious material and water, and may contain an admixture if authorized. Cementitious material must comply with section 90-1.02B, except SCMs are not required. The minimum cementitious material content of the grout must not be less than 845 lb/cu yd of grout.
2. Aggregate must be used to extend the grout as follows:
 - 2.1. Aggregate must consist of at least 70 percent fine aggregate and approximately 30 percent pea gravel, by weight.
 - 2.2. Fine aggregate must comply with section 90-1.02C(3).
 - 2.3. Size of pea gravel must be such that 100 percent passes the 1/2-inch sieve, at least 90 percent passes the 3/8-inch sieve, and not more than 5 percent passes the no. 8 sieve.
3. California Test 541 is not required.
4. Grout is not required to pass through a sieve with a 0.07-inch maximum clear opening before being introduced into the grout pump.

Before grinding and grooving, deck surfaces must comply with the smoothness and deck crack treatment requirements.

Grind and groove the deck surface as follows:

1. Grind the surface to within 18 inches of the toe of the barrier under section 42-3. Grinding must not reduce the concrete cover on reinforcing steel to less than 1-3/4 inches.
2. Groove the ground surfaces longitudinally under section 42-2. The grooves must be parallel to the centerline.

51-1.03F(5)(b)(iii) Longitudinal Tining

When texturing the deck surface by longitudinal tining, perform initial texturing with a burlap drag or broom device that produces striations parallel to the centerline. Perform final texturing with spring steel tines that produce grooves parallel with the centerline.

The tines must:

1. Be rectangular in cross section
2. Be from 3/32 to 1/8 inch wide on 3/4-inch centers
3. Have enough length, thickness, and resilience to form grooves approximately 3/16 inch deep

Construct grooves to within 6 inches of the layout line of the concrete barrier toe. Grooves must be from 1/8 to 3/16 inch deep and 3/16 inch wide after concrete has hardened.

For irregular areas and areas inaccessible to the grooving machine, you may hand construct grooves. Hand-constructed grooves must comply with the specifications for machine-constructed grooves.

Tining must not cause tearing of the deck surface or visible separation of coarse aggregate at the surface.

Replace the 2nd and 3rd paragraphs of section 51-2.02B(3)(b) with:

04-20-12

Concrete saws for cutting grooves in the concrete must have diamond blades with a minimum thickness of 3/16 inch. Cut both sides of the groove simultaneously for a minimum 1st pass depth of 2 inches. The completed groove must have:

1. Top width within 1/8 inch of the width shown or ordered
2. Bottom width not varying from the top width by more than 1/16 inch for each 2 inches of depth
3. Uniform width and depth

Cutting grooves in existing decks includes cutting any conflicting reinforcing steel.

Replace the 2nd paragraph of section 51-2.02E(1)(e) with:

08-05-11

Except for components in contact with the tires, the design loading must be the AASHTO LRFD Bridge Design Specifications Design Truck with 100 percent dynamic load allowance. Each component in contact with the tires must support a minimum of 80 percent of the AASHTO LRFD Bridge Design Specifications Design Truck with 100 percent dynamic load allowance. The tire contact area must be 10 inches measured normal to the longitudinal assembly axis by 20 inches wide. The assembly must provide a smooth-riding joint without slapping of components or tire rumble.

04-20-12

Delete the 2nd paragraph of section 51-4.01A.

